THE SOUTHEAST ALASKA NORTHERN SOUTHEAST INSIDE SABLEFISH FISHERY INFORMATION REPORT WITH OUTLOOK TO THE 2002 FISHERY

by
Beverly Richardson
and
Victoria O'Connell

Regional Information Report No.[1] 1J02-34

Alaska Department of Fish and Game
Division of Commercial Fisheries
Juneau, Alaska

August 2002

[1] The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Division of Commercial Fisheries.

Cover photo by Pat Malecha, NMFS.

AUTHORS

Beverly Richardson is a research analyst II for the Alaska Department of Fish and Game groundfish project in Region I, Southeast Alaska. Her address is P.O. Box 667, Petersburg, Alaska 99833-0667 and she can be reached through email at beverly_richardson@fishgame.state.ak.us.

Victoria O'Connell is the Alaska Department of Fish and Game's groundfish project leader in Region I, Southeast Alaska. Her address is 304 Lake Street, Room 103, Sitka, Alaska 99835-8563. She can be reached by email at victoria_oconnell@fishgame.state.ak.us.

ACKNOWLEDGEMENTS

The authors thank Scott Kelley, Jackie Tyson, and Cori Cashen for review of this document and their useful suggestions. Cori Cashen formatted the document, Dave Carlile provided statistical analysis, Cleo Brylinsky and Cori Cashen produced the map figures, Pat Malecha, NMFS provided the cover photograph. Thanks to the 2001 port samplers: Mike Vaughn, Kamala Carroll, Deidra Holum, Rex Stafford, Becky Knight, Vera Goudima, Paul Evans, Anne Reynolds, Wade Porter, Shannon Stragier, Anne Carlson, Jim Spignesi, and Tamara Brownell. Thanks also to the commercial fishermen and processors that participate in the NSEI fishery and provide valuable insight and allow access to their product.

This research was partially supported under NOAA grants Alaska Fisheries Information Network NA97FN0121, Interjurisdictional Fisheries Act NA06FI0074, and Nearshore Marine Research III NA16FN1560.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Page

LIST OF APPENDICES

Page

INTRODUCTION

Sablefish (*Anoplopoma fimbria*), also called blackcod, are a commercially important species throughout their range and are harvested primarily with longline or pot gear (Figure 1). They are a deepwater marine finfish, black to greenish gray in color, and are highly prized for their high oil content. The Alaska Department of Fish and Game (ADF&G) Southeast Region manages two sablefish fisheries, one in the Southern Southeast Inside (SSEI) subdistrict commonly referred to as the Clarence sablefish fishery and one in the Northern Southeast Inside (NSEI) subdistrict commonly referred to as the Chatham sablefish fishery. This report details the commercial longline fishery and management of sablefish in the NSEI subdistrict (Figure 2). Information on research and stock assessment for this fishery is not discussed in detail in this document but is available through a separate Regional Information Report: SOUTHEAST ALASKA SABLEFISH STOCK ASSESSMENT ACTIVITIES 1988–2002, RIR IJ02-02 (Carlile et al. 2002).

General Biology of Sablefish

Sablefish are one of two species that make up the Anoplopomatidae family that includes sablefish and skillfish *(Erilepis zonifer)*. Sablefish inhabit the northeastern Pacific Ocean from the Bering Sea and adjacent waters of Hokkaido, Japan to Baja, California with the greatest abundance in the Gulf of Alaska (Wolotira et al. 1993). They are divided into two populations: a northern population that includes all of Alaska and northern British Columbia waters and a southern population that includes all sablefish from southern British Columbia south to California. These populations were divided based on differences in size at maturity, growth, and movement (McDevitt 1990).

Adult sablefish inhabit the deeper water areas of the continental shelf, the slope, and the deep-water coastal fjords. Most adults live in depths of 366 to 915 m (200 to 500 fm) although they have been found in depths less than 183 m (100 fm) and greater than 1,830 m (1,000 fm) (Allen and Smith 1988) and are generally found near bottom (Krieger 1997).

They are a long-lived species with ages over 40 commonly appearing in commercial fishery samples. The maximum reported age for Canada is 55 years (McFarland and Beamish 1983), for Alaska, 94 years (Kimura et al. 1998), and for NSEI, 88 years (Carlile et al. 2002). Sablefish are difficult to age and there are geographic differences in growth patterns. In the Gulf of Alaska the oldest males average a length of 69 cm and a weight of 3.4 kg. Old females average 83 cm in length and 6.2 kg in weight (Sigler et al. 2001). Fifty percent of females are sexually mature at 65 cm (6.5 years) and fifty percent of males are mature at 57 cm (5 years for males) (Sasaki 1985). Sablefish sampled during ADF&G surveys from 1997–2001 in NSEI had a maximum length of 110 cm for females and 95 cm for males.

Sablefish spawn in pelagic waters in depths of 300–500 m (164–273 fm) in the spring of the year in areas near the edge of the continental slope (McFarlane and Nagata 1988). Eggs develop at depth and larvae develop near surface waters. Sablefish juveniles exhibit rapid growth growing 1.2 mm d^{-1} (where d=day) during their first spring and summer (Sigler et al. 2001). Juvenile sablefish reside in continental shelf waters, often in bays and nearshore waters, moving to the continental shelf beginning around age 2 (Sigler et al. 2001).

The published natural mortality estimates for sablefish in the Gulf of Alaska range from 0.10 (10%) (Sigler et al. 2001, Funk and Bracken 1984, and Johnson and Quinn 1988) to 0.22 (22%) (Low et al. 1976). The current National Marine Fisheries Service (NMFS) stock assessment for the Gulf of Alaska uses a rate of 0.10 (10%). Hoenig's formula for estimating natural mortality yields a natural mortality rate of 0.05 (5%) for NSEI sablefish (Hoenig 1983).

Adult sablefish are opportunistic feeders, preying on fishes (including pollock, eulachon, capelin, herring, sandlance, and Pacific cod), squid, euphasids, and jellyfish (Yang and Nelson 2000). Yearling sablefish feed primarily on euphasids (Sigler et al. 2001).

Juvenile sablefish are eaten by adult coho and chinook salmon. ADF&G troll logbooks from 1977 through 1984 reported young of the year sablefish as the fourth most common species in the stomach contents of coho and chinook salmon (Wing 1985). Pacific halibut is the only other species documented in a food study in the Gulf of Alaska as preying on juvenile or adult sablefish, with sablefish comprising less than 1% of their stomach contents (Yang and Nelson 2000).

Survey and Port Sample Data

Biological information specific to the NSEI sablefish fishery is collected during annual longline research surveys and, beginning in 2000, from dockside samples from the commercial fishery. Length frequency distributions from research surveys generally show a uni-modal distribution; however, beginning in 1998 there is a bi-modal distribution with fewer larger fish occurring. This bi-modal distribution is clearly present in 1999 and 2001 and it appears there is incoming recruitment, particularly in 2001 (Figure 3). Length frequencies from the commercial catch display a larger average size and more large fish than survey samples and the distributions are more normally distributed (Figure 4). In 2001 8,867 NSEI sablefish fishery lengths were recorded in three ports (Sitka, Juneau, Petersburg). These ranged in length from 40 cm to 108 cm with a mean of 65 cm. The fishery lengths this year show little variance from 2000 when 3,079 lengths were recorded and ranged from 41 cm to 107 cm with a mean of 67 cm. The 2001 lengths showed more concentration of lengths of fish around the mean, less large fish overall, and smaller fish except for the very little ones (Figure 4).

Otoliths collected on surveys are aged using break-and-burn techniques (Williams and Bedford 1974). The age data from NSEI do not always show specific year classes progressing consistently through time (Figure 5). It is possible that sablefish are recruiting into the NSEI area at a variety of ages, including older ages, by immigration from areas outside NSEI. This possible multiple-age recruiting could mask the progression of year classes that might normally be evident when fish recruit to a population at a single young age, or series of younger ages, and then progress, over time, through the population. Tag data suggests that once recruited in NSEI, most of these sablefish are resident and therefore strong year classes should be able to be tracked through time (Carlile et al. 2002). It is possible that the annual sample sizes (n= 206 to 554) for determining age compositions are too small and the occurrence of consistent progression of year classes through the population over time consequently may not be evident. Sablefish are difficult to age and aging errors may also mask the contribution of these year classes to the fishery. Otoliths collected from the 2001 NSEI longline survey show an average age of 13 years and range between 2 and 44 years (Figure 5). The 2000 and 2001 age distributions indicate some incoming recruitment and very few fish older than 25 years (Figure 5).

FISHERY

History of Fishery

It is not known when sablefish were first commercially harvested in the internal waters of Southeast Alaska. The first landing records of sablefish from this area were for 59,000 pounds in 1906 (Kolloen 1944, Bergmann 1975, Figure 6). Frederick Sound was considered a prime fishing ground through the early 1940s when catches diminished and the fleet moved into Chatham Strait (Figure 2). Prior to the 1940s, sablefish were primarily landed as incidental catch in the halibut fishery; however, there is a report of a directed blackcod trip in NSEI as early as 1913 (Bergmann 1975). Halibut longline gear was modified in the late 1940s to specifically target sablefish. In 1948 the fishing vessel *Wolverine* began targeting sablefish with small, eyed hooks and 9 foot to 13 foot hook spacing. It was believed that the smaller hooks would reduce the loss of fish due to "spin-off" as the gear was hauled to the surface. The Alaska Department of Fisheries conducted a gear comparison survey in Chatham Strait in 1949 and concluded that catch per skate of sablefish was greatly improved when using the new gear compared to standard halibut gear (Edson 1954). Sablefish was valued not only for its flesh, but also for its liver and viscera. Prior to the development of synthetic vitamins, sablefish oil was highly prized in the manufacturing of vitamins. In 1943 the price per pound was 10 cents for the flesh, 35 cents for the viscera, $1.65 for liver (Kolloen 1944).

Harvest levels fluctuated widely until the 1970s due to price and increased opportunities in other fisheries, with high catch years associated with both World War I and World War II. Reported harvest has ranged from 26,984 round pounds in 1912 to 6.5 million round pounds in 1947. Recent high harvest was in 1997 when 4.75 million round pounds was landed (Table 1). The accuracy of catch data prior to 1985 is questionable, especially in earlier years given limited information on landing records.

The history of management actions is listed in Table 2. Season limitations were first imposed in 1945 with the season limited from mid March until the end of November. This season reduction was requested by the commercial fleet over their concerns that the spawning stock was being heavily harvested (Kolloen 1944). Catch per unit effort data, in terms of fish per skate, shows a declining trend between 1940 and 1950. Average weight decreased during this time period as well. An industry recommended harvest limit of 1 million dressed pounds was implemented in 1973 (Table 2; Figure 6). ADF&G recommended a reduction in quota to 850,000 dressed pounds in 1979 and then moved to a guideline harvest range of 500,000 to 900,000 dressed pounds in 1980 based on historic catches. Seasons were shortened as effort escalated in the 1970s and 1980s (Bracken 1983). The fishery has been limited to longline gear since 1981.

Fleet effort and efficiency continued to increase dramatically and by 1984 the season was reduced to five days in the NSEI area (Table 2). In 1985, a limited entry program was implemented for the sablefish fishing fleets in NSEI (CFEC regulation 20 AAC 05.701-05.711) and the guideline harvest range (GHR) was set at 500,000 to 1,500,000 dressed pounds. However, the overall operating efficiency of the NSEI longline fleet increased seven fold after the limited entry program was established. The average number of hooks set per vessel per day increased from 4,791 in 1984 to 28,514 in 1993. In order to stay within harvest objectives, the department continued to reduce the number of fishing days. The season length went from 76 days in 1980 to one day in 1987 (Table 2). A one-day opening continued until 1993. In that year, the fleet harvested 3,640,000 dressed pounds, 2,140,000 pounds over the upper bounds of the 1,500,000 dressed pound GHR (Figure 6). In an effort to improve management and to promote a safer

fishery, the Alaska Board of Fish (BOF) adopted an equal quota share (EQS) system for the NSEI fishery beginning in 1994, to be evaluated in 1997. This plan was recommended by a working group of industry representatives and state fisheries managers after extensive negotiations. Under the EQS system each permit holder was given an equal share of the annual quota and the season was extended. The upper end of the GHR was increased to 3 million dressed pounds (4.76 million pounds round weight) at the time this system was implemented. The EQS system was made permanent in 1997 based on fleet and department recommendations. Logbooks detailing catch and effort by set became mandatory (Figure 7). At that same time the season was set in regulation for September 1 through November 15 (Table 2) and the GHR was set at 1.59–4.8 million round pounds. Annual EQSs have ranged from a high of 41,700 to 19,600 round pounds (Table 2). The EQSs vary annually based on the total quota and number of legal participants for that year.

The fishery quota was lowered 35% in 1999 from 4.8 million round pounds to 3.12 million round pounds. This decision was based on the poor fishery performance over the prior 5 years and acknowledgement of the general decline in sablefish abundance coast wide (Sigler et al. 1997). The quota was further lowered by 30% in 2001 to 2.184 million round pounds based on fishery CPUE and a mark-recapture-based estimate of exploitation rate that suggested the exploitation rate for the 2000 fishery was higher than prudent.

Fleet Size

Between 1975 and 1984 the fleet size ranged from a low of 46 permits in 1982 to a high of 125 permits in 1976 (Table 1). In 1985 the Commercial Fishery Entry Commission (CFEC) implemented the limited entry program for the NSEI sablefish fishery with the objective that there would eventually be approximately 73 permanent permit holders (AS 16.43.270). As is typical of limited entry programs the fleet size increased dramatically once limited entry was implemented. There were 158 interim use permits fishing two years after the implementation compared to 86 permits the year prior to implementation (Table 1). To date CFEC has completed work on 124 of the 167 applications received and 43 cases remain to be decided. Of the 109 permits that may fish in 2002, 39 are permanent permits; the rest remain interim use permits.

Catch Per Unit of Effort

Fishery catch per unit of effort (CPUE) information was collected through skipper interview and voluntary logbook programs prior to 1997 and through a mandatory logbook program beginning in 1997. Fishery CPUE in this document is expressed as total round pounds/total hooks adjusted for hook spacing and for hook type. CPUE is affected by hook spacing and NMFS uses the following formula for CPUE standardization for commercial sablefish catch data (Sigler et al. 2001):

$$n_s = n_u * 2.2 * (1-\exp(-0.57 \text{ hook spacing})),$$

where n_s is the number of standardized hooks, n_u is the number of unstandardized hooks and hook spacing is expressed in meters and standard hook spacing is 1 m.

Hook type effects CPUE. Historically j-hooks were considered the standard hook style for this fishery. Circle hooks, which dramatically increased catchability, were first reported in the NSEI sablefish fishery beginning in 1983. CPUEs for j-hook data have been adjusted using a factor of 1.5. This rate is the rate

NMFS uses as a conversion from the sharp tara hooks from the Japanese longline survey to circle hooks and should be considered a conservative adjustment factor for j-hooks as it is expected that tara hooks are more effective than j-hooks. No adjustments have been made for differences in bait use or hook size.

The fishery CPUE was low in the early 1980s, increasing in the mid 1980s with the recruitment of very strong year classes (Figure 8) (Carlile et al. 2002). Due to these strong years classes the CPUE remained above 1 pound per hook from 1982 through 1993. In 1994 the fishery pound-per-hook began to show a marked decline. A declining fishery CPUE between 1993 and 1994 was not unexpected because of the change in management from a derby style to the EQS fishery. However, the continued decline in fishery pound-per-hook since 1994 is of concern. The round-pound-per-hook continued to decline until 2000 when it leveled off at 0.5, which is the second lowest fishery CPUE since 1980.

Research Activities

The department is involved in several projects to aid in assessment and management of NSEI sablefish. Annual longline surveys have been conducted since 1988. In recent years three commercial vessels have been chartered annually to simultaneously conduct the survey. The objective of these surveys has been to provide CPUE and biological data to assess the abundance and general condition of the sablefish resource in Chatham Strait (Carlile et al. 2002, Richardson i*n press a*). These surveys are important to the assessment of stock condition and will continue to be conducted annually.

Mark-recapture studies have been conducted since 1997. For the past three years ADF&G has chartered a sablefish pot vessel to mark sablefish in NSEI during late June and early July. More than 20,000 fish have been marked in the past three seasons (Carlile et al. 2002, Richardson 2001, Richardson i*n press b*). This research provides us with information to estimate exploitation rates and abundance of NSEI sablefish (Carlile et al. 2002).

The department is currently involved in a study to evaluate the use of passive integrated transponder (PIT) tags to mark sablefish. These are internal tags that will be automatically detected by receivers installed in processing plants. Use of PIT tags should increase the detection rate of the number of tagged fish landed, allow estimation of abundance by size strata, and increase efficiency of the recapture phase of this study (Carlile et al. 2002).

Non-Directed Sablefish Removals

Sablefish are taken incidentally in fisheries for other species, most notably in the halibut longline fishery. There is no data available on the magnitude or mortality of these catches. In inside state waters sablefish may be legally taken for use as bait and regulations require that this use be reported on fish tickets. There appears to be poor compliance with this reporting requirement as little bait use of sablefish is reported while anecdotal information suggests that sablefish are routinely used for bait. Sablefish may also be legally taken in the personal use fishery. Currently there are no reporting requirements for the personal use fishery and these removals remain undocumented.

The 2001 Commercial Fishery

The 2001 fishery opened at 8:00 a.m., September 1 and remained open through noon, November 15 as set by regulation (5 AAC28.110(a)). This was the eighth year since the initiation of the EQS system for this fishery and the fifth year since the EQS fishery was made permanent in NSEI. The 2001 quota was set at 2.184 million round pounds, a 30% reduction from the 2000 and 1999 quotas. The number of allowable interim use and permanent permits was 111 in 2001, the same as in 2000, and represents a gradual reduction from the 122 allowed to fish in 1994–1997. The 2001 EQS was 19,600 round pounds, a decline of 50% in the EQS since the initiation of the EQS system in 1994 (Table 2).

The total directed commercial harvest from NSEI in 2001 was 2,142,617 round pounds or 98% of the quota. Of this harvest, 11,930 round pounds (0.5% of 2001 quota) were landed as overages compared with 10,830 rounds pounds (0.35% of 2000 quota) of overage landed in 2000.

Eighty-seven individual vessels made at least one landing during the 2001 fishery compared with 94 vessels in 2000, a 7.5% reduction. Forty-one of the vessels (47%) that fished this year have participated in the fishery for each of the past five years with only five new vessels participating in 2001 that had not participated in any of the past seven years.

The 111 permits made a total of 296 landings in 2001, a 20% decrease in the total number of landings compared with 372 in 2000. This was due primarily to the decrease in the quota share. The maximum number of landings per permit in 2001 decreased to 8 from 9 in 2000, and the average number of landings per permit in 2001 was 2.7, down 20% from 2000. In 2001, 20 permits finished their EQS in one landing and 43 made only two landings compared with 10 and 30 respectively in 2000. Twenty-five percent of the catch was landed by September 4, 50% by September 16, and 90% by October 26.

The majority of the harvest came from statistical areas 345631, 345701, 345731, and 345603 (Figure 9). Together these areas accounted for 85% of the landed catch (Table 3). There was a shift in removals from 2001. Notably, catch was down in the Cape Omanney to Patterson Point area (345603), accounting for 11.7% of the landed catch compared to 20.6% in the 2000 fishery. Statistical areas 345702 (in Frederick Sound) showed a slight increase in percent of catch, accounting for 5.6% of total landed catch.

Despite a notable increase in the 2001 survey CPUE (Carlile et al. 2002), both overall and for a majority of the sets, the fishery pound-per-hook for 2001 was relatively flat (Figure 7). The overall CPUE for the 2001 fishery from landings with valid logbooks (all landings that had complete information) was 0.52 round pounds per hook compared to 0.51 in 2000 and 0.52 in 1999.

The primary landed bycatch in the NSEI sablefish fishery is shortspine thornyheads (*Sebastalobus alascanus*) and shortraker (*Sebastes borealis*) and rougheye (*Sebastes aleutianus*) rockfishes. Other bycatch species landed include redbanded rockfish (*Sebastes babcocki*) and arrowtooth flounder (*Atheresthes stomias)*. Skates (Rajidae), Dover sole (*Microstomus pacificus)*, and Pacific sleeper sharks (*Somniosus pacificus*) are also taken as bycatch but are not usually landed.

A total of 220,017 pounds of bycatch was landed in the 2001 sablefish fishery, roughly half of the landed bycatch in 2000. The primary landed bycatch was shortspine thornyheads (68% percent) followed by shortraker (16%) and rougheye rockfish (13%). This decrease in total bycatch is reflective of the decrease in sablefish quota. The landed bycatch of all species was approximately 11% of the total 2001 sablefish

harvest compared with almost 15% bycatch landed in 2000 (Table 4). The reason for the decrease in the percent of bycatch of rockfish is unclear. Since July 2000 a full retention policy has been in place in inside state waters that requires all *Sebastes* rockfish to be landed and weighed.

Landings were made in Angoon, Hoonah, Juneau, Petersburg, Pelican, Sitka, Wrangell, and Ketchikan. Petersburg had a 5% increase in total pounds landed over last year and Angoon had a 16% increase. No vessels landed out of the Southeast region in 2001, while in 2000 NSEI sablefish were landed in Bellingham and in Seward.

The NSEI sablefish fishery is important to the Southeast Alaska economy. Sablefish continue to be a high value fish. The 2001 average exvessel price reported at the time of landing for sablefish in 2001 was in excess of $2.12 per round pound yielding an exvessel value in excess of 4.6 million dollars for the 2001 NSEI sablefish fishery.

2002 FISHERY OUTLOOK

The 2002 NSEI sablefish quota is 2,005,000 round pounds (Table 5). There are 109 permits allowed to fish this year, hence the EQS will be 18,400 round pounds.

In February of 2002 the Alaska Department of Fish and Game convened a panel of outside fishery experts to conduct an independent review of the stock assessment program for the NSEI sablefish fishery. A report detailing past stock assessment and management programs was prepared and given to the review committee in advance of the panel meeting (Carlile et al. 2002). The Panel met with ADF&G staff to discuss the stock assessment report and to gain further insight into the details of the fishery and assessment. They then convened privately to draft recommendations for consideration. The Panel report, "A Review of the Chatham Strait Sablefish Stock Assessment Program," is appended to this document (Appendix 1). Based, in part, on this review and on additional assessment data available in 2002, the department took a new approach for quota setting. The quota was set based on a harvest rate applied to an estimate of biomass. Previous quotas have been set based on historical catch levels and evaluation of fishery and survey data.

Mark-recapture data was used to estimate exploitable biomass for NSEI sablefish. A Peterson estimator applied to mark-recapture data from tail-clipped fish was calculated (Seber 1982). The Peterson estimate yielded a biomass point estimate of 23 million round pounds with a lower 90% confidence limit of 21.5 million round pounds (Carlile in preparation)[2]. The lower 90% confidence limit was used to estimate exploitable biomass. This approach is consistent with ADF&G management of demersal shelf rockfishes and well as other species (i.e. urchins, cucumbers) and is a way to account for uncertainty. A conservative approach is especially appropriate due to concerns of low stock levels.

A harvest rate of $F_{40\%}$ (0.101) was applied to the lower 90% confidence limit to yield a total allowable catch (TAC) of 2,171,500 round pounds for all fisheries in NSEI. The harvest rate $F_{40\%}$ refers to the harvest rate that would provide for an equilibrium level of spawning per recruit equal to 40% of the equilibrium level of spawning per recruit in absence of any fishing.

[2] Details of the stock assessment will be available in a Regional Information Report: D. Carlile. 2002. 2002 Chatham Sablefish Assessment. This report is currently in preparation for publication.

Before setting the directed fishery quota for 2002, estimates of mortality associated with all other fisheries and discard mortality associated with the directed fishery must be removed. This was a difficult number to estimate as there was little information available. We anticipate that refinements will be made to these estimates annually as more information becomes available.

The largest source of bycatch mortality is likely to be incurred in the longline fishery for halibut in NSEI. Information on bycatch in this fishery is lacking, therefore the International Pacific Halibut Commission (IPHC) halibut survey data from 2000 and 2001 was used to estimate bycatch. Twelve survey sets from NSEI stations set in waters deeper than 183 m (100 fm) were used to determine bycatch rates of sablefish (Table 6). IPHC data is reported as pounds of halibut and numbers of sablefish. Numbers of sablefish were converted to round pounds using a 6.6-pound average consistent with the 2001 NSEI sablefish longline survey samples. These data showed an overall bycatch of 0.26 (26%) round pounds of sablefish to round pounds of halibut.

According to IPHC data approximately 10% of the 2C halibut quota is taken from NSEI in waters deeper than 183 m (100 fm) by fishers targeting halibut. For 2002 that poundage is 850,000 round pounds halibut. Applying the 0.26 bycatch rate yields an estimated total sablefish catch associated with the directed halibut fishery in NSEI of 221,000 pounds. We assumed that 50% of this total bycatch was mortality due to sandfleas, use as bait, or hooking injuries. For 2002, this number is intended to also account for other sources of non-directed mortality such as unreported legal bait sets for sablefish and mortality associated with the crab fisheries.

There is also discard mortality associated with the directed fishery through some mortality of small fish released and mortality of discards due to sand fleas, shark bites, and other injuries. ADF&G survey data (average from 1999–2001) indicates that in relation to retained catch 2% of fish from the survey are discarded due to fleas or shark bites, 3.5% of fish from the survey are lost before landing, and 6.5% of fish are small and are carefully released. This last number varies considerably by year, possibly reflecting recruitment. For this year we estimated that 3% of the remaining TAC (after halibut bycatch mortality and bait removals) is assumed to be mortality during the directed fishery. For 2002 this amounts to 62,000 pounds, approximately 700 pounds per permit.

PERMITS/PAPERWORK NEEDED TO FISH IN NSEI SABLEFISH FISHERY

- Valid CFEC limited entry permit card specific to the NSEI Sablefish Fishery.
- ADF&G Vessel license.
- Vessel registration filed prior to fishing and kept onboard while fishing.
- Logbook completed daily, copies kept on board the vessel for the duration of the fishery, including a record of the round weight delivered to date if multiple deliveries are made per season and pages documenting the landing attached to the fish ticket at the time of landing. Use of ADF&G Longline-Pot Fishery Logbooks is requested. ADF&G logbooks are available at ADF&G offices.
- Valid CFEC permit card for Miscellaneous Finfish if intending to retain bycatch beyond what is allowable legal bycatch on a sablefish permit.

Applications for CFEC gear cards, emergency transfer requests, and ADF&G vessel registrations are available at ADF&G offices or on the web at http://www.cfec.state.ak.us/mnuaf.htm

Delivering Fish out of State

Delivering fish out of state takes prior planning, well in advance of fishing, as several agencies and permits are required. In order to take unprocessed fish out of the state, an individual or company must have an exporter license. There are two different types of exporter licenses, buyer or catcher. The buyer can buy from fishers and export unprocessed fish while the catcher can only export their own catch. The Department of Revenue requires the exporter to be bonded and prepay taxes before they can operate. All processor and exporter applications are together in the "2002 Alaska Seafood Processor and Exporter License and Permit Application: Intent to Operate." The weblink for this application is:

http://www.cf.adfg.state.ak.us/geninfo/permits/intent/instruct.pdf

Fishers are required to complete a fish ticket and a physical copy of the fish ticket must be provided to ADF&G before the vessel leaves the state. A completed fish ticket must include:

1. weight of each species with the corresponding condition (delivery) code (i.e., round, bled, headed and gutted etc),
2. an imprint of the valid CFEC gear card,
3. an imprint of a valid Alaskan processor code,
4. a breakdown by percentage of the groundfish statistical areas fished,
5. signatures of fishers and processor at bottom of fish ticket, and
6. a completed logbook documenting the landing must be attached to the ticket.

If fish weights are estimated a completed fish ticket with final weights must be returned to ADF&G within 7 days of landing**.** If the processor is someone other than the fishers, ADF&G must have a letter authorizing the use of the Alaskan processor code used on the fish ticket before the fish ticket is completed and filed with the department.

SYNOPSIS OF 2001–2002 REGULATIONS THAT PERTAIN TO THE NSEI SABLEFISH FISHERY

Commercial Fishery Regulations are available on the web at:

http://www.cf.adfg.state.ak.us/geninfo/regs/cf_regs.htm

These statues and administrative regulations were excerpted from the official codes on file with the Lieutenant Governor. There may be errors or omissions that have not been identified and changes that occurred after this (paper) was written. This (synopsis) is intended as an informational guide only. To be certain of the current laws, refer to the official codes.

5 AAC 28.105. Description of Eastern Gulf of Alaska Area districts, subdistricts, sections, and sectors

(2) Northern Southeast Inside (NSEI) Subdistrict: All waters of Frederick Sound, Stephens Passage, Lynn Canal, Icy Strait, Glacier Bay, Chatham Strait, and contiguous bays and inlets bordered by a line from Beacon Point to Wood Point, from Point Camden to Salt Point Light, the Cape Decision Light to a point west of Gish Bay at 55° 54.53' N. lat., 134° 12.50' W. long. to the southernmost tip of Helm Point to the westernmost tip of Hazy Island to the Cape Ommaney Light, north of 57° 30' N. lat. in Peril Straight, from the westernmost tip of Column Point to the northernmost tip of Soapstone Point and from the southernmost tip of Cape Spencer through Yakobi Rock to Yakobi Island;

5 AAC 28.106. Eastern Gulf of Alaska Area registration

(b) Notwithstanding 5 AAC 28.020(a) , before a person uses a vessel to operate gear to take sablefish in the Northern Southeast Inside (NSEI) Subdistrict or the Southern Southeast Inside (SSEI) Subdistrict, the vessel owner, or the owner's agent, shall register the vessel with the department as follows:

(1) the vessel must be registered before fishing in the sablefish fishery;

(2) the vessel owner, or the owner's agent, shall include on the registration form the vessel's name and the full name and CFEC permit number or interim use permit number of each sablefish permit holder who will be on board the vessel during the open fishing period;

(3) the vessel owner, or the owner's agent, shall sign the registration form;

(4) a person who holds a CFEC sablefish permit or interim use sablefish permit for the NSEI Subdistrict or for the SSEI Subdistrict may not register to fish on more than one vessel at a time;

(5) a separate registration is required for each subdistrict.

5 AAC 28.110. Sablefish fishing seasons for Eastern Gulf of Alaska Area

(a) In the Eastern Gulf of Alaska Area, sablefish may be taken only as follows:

(1) in the Northern Southeast Inside Subdistrict, from 8:00 a.m. September 1 until 12:00 noon November 15;

5 AAC 28.130. Lawful gear for Eastern Gulf of Alaska Area

(a) In the Northern Southeast Inside Subdistrict, the Southeast Outside Subdistrict, and the East Yakutat District, sablefish may be taken only with longlines. In the Southern Southeast Inside Subdistrict, sablefish may be taken only with longlines and pots.

(b) In the Southeast District, a longline vessel may have aboard or use for taking bait a gillnet with mesh size of not over two and one-half inches and made of not greater than Number 20 gillnet thread.

5 AAC 28.160. Harvest guidelines and ranges for Eastern Gulf of Alaska Area

(a) In the Northern Southeast Inside Subdistrict, the guideline harvest range for the taking of sablefish is 1,590,000 to 4,800,000 pounds in round weight (721 to 2177 m.t.).

5 AAC 28.170. Sablefish possession and landing requirements for Eastern Gulf of Alaska Area

(a) The operator of a vessel taking sablefish in the Northern or Southern Southeast Inside Subdistricts shall, before taking sablefish in another area, unload all sablefish taken in either subdistrict and submit a completed fish ticket to the department.

(b) The operator of a fishing vessel may not take sablefish in the Northern or Southern Inside Subdistricts with sablefish taken in another area on board.

(c) In the Northern and Southern Southeast Inside Subdistricts, and in the waters of Alaska within the Southeast Outside Subdistrict, a sablefish bearing a fisheries agency tag at the time of capture may be retained and sold at any time, if the fish is landed with the tag intact and the recovery is reported to the department at the time of landing. The tagged fish must be presented to a local representative of the department upon request.

(f) In the Northern Southeast Inside Subdistrict, the holder of a CFEC permit or interim use permit for sablefish may not take more than the annual amount of sablefish specified by the department. The department shall determine the annual amount by dividing the annual harvest objective, not to exceed 4,800,000 round pounds, by the number of CFEC permits and interim use permits issued for the fishery. The department shall establish the annual harvest objective based on information, including harvest rate and biological information, gathered during the department's pre-season stock assessment survey.

(i) When participating in the sablefish fishery in the Northern Southeast Inside Subdistrict or Southern Southeast Inside Subdistrict, a person holding a CFEC permit or interim use permit for that fishery must retain in the person's possession and present for inspection onboard the vessel on which that person is registered to fish, a copy of each completed fish ticket issued to the person for the current season.

5 AAC 28.171. Rockfish possession and landing requirements for Eastern Gulf of Alaska Area

(a) In the Southeast District, a CFEC permit holder must retain, weigh, and report all demersal shelf rockfish taken. Except as provided in (b) of this section, all demersal shelf rockfish in excess of 10 percent, round weight, of all target species on board the vessel must be weighed and reported as bycatch overage on an ADF&G fish ticket. All proceeds from the sale of excess demersal shelf rockfish bycatch shall be surrendered to the state.

(b) In the Southeast District, a person operating a trawl vessel shall retain, weigh, and report all demersal shelf rockfish taken. All demersal shelf rockfish in excess of one percent, round weight, of all target species on board the vessel must be weighed and reported as bycatch overage on an ADF&G fish ticket. All proceeds from the sale of excess demersal shelf rockfish bycatch shall be surrendered to the state.

(c) The department may establish additional bycatch allowances by emergency order.

(f) In addition to the requirements of (a) of this section, the Northern Southeast Inside and Southern Southeast Inside Subdistricts, a CFEC permit holder must retain, weigh, and report all rockfish taken. All rockfish in excess of allowable bycatch limits shall be reported as bycatch overage on an ADF&G fish ticket. Any proceeds from the sale of excess rockfish bycatch shall be surrendered to the state.

5 AAC 28.174. Spiny dogfish (*Squalus acanthias*) possession and landing requirements for Eastern Gulf of Alaska Area

In the Eastern Gulf of Alaska Area, spiny dogfish may be taken and retained only as follows:

(1) in the Southeast District, a longline vessel may retain spiny dogfish as bycatch that is not more than 35 percent, by round weight, of all target species taken in the directed fishery on board the vessel;

5 AAC 28.175. Logbooks for Eastern Gulf of Alaska Area

(a) An operator of a vessel fishing for groundfish in the waters of Alaska in the Eastern Gulf of Alaska Area or in a state-managed directed fishery in the waters of the exclusive economic zone adjacent to the Eastern Gulf of Alaska Area shall maintain an accurate logbook of all fishing operations for each type of gear used.

(b) A logbook described in (a) of this section

(1) for longline gear must include the date, the specific location of harvest by latitude and longitude within one-half mile of set, the amount of gear (number of hooks) used, the depth of each set, the estimated weight of all target species taken in the directed fishery in each specific location, and an estimated weight of the bycatch retained or discarded at sea; for the Northern Southeast Inside Subdistrict and the Southern Southeast Inside Subdistrict sablefish fisheries, a logbook must include a record of the round weight delivered, the purchasing processor, and date of each delivery during that season if multiple landings have been made;

(3) must be updated, within 24 hours after midnight local time on the day of operation; and

(4) must be retained, with its original pages, for a period of two years by the owner or operator of the vessel.

(c) A logbook described in (a) of this section must be kept on board the vessel while operating gear, during transits to or from a port of landing, and for five days after delivering groundfish.

(e) A logbook described in (a) of this section must be made available to a local representative of the department upon request.

(f) A copy of the page of the logbook described in (a) in this section pertaining to a landing must be attached to the fish ticket documenting the landing.

(g) A person may not make a false entry in the logbook described in (a) of this section.

5 AAC 28.180. Prohibitions for Eastern Gulf of Alaska Area

(a) A vessel or a person on board a vessel from which commercial, subsistence, or personal use longline fishing gear was used to take fish in the Northern or Southern Southeast Inside Subdistricts during the 72-hour period immediately before, or from which that gear will be used during the 24-hour period

immediately after an open sablefish fishing period, may not participate in the taking of sablefish in either subdistrict during that open sablefish fishing period.

(b) Unless authorized by the terms of a scientific, propagative, or educational permit issued under AS 16.05.340 (b), a person may not possess groundfish in a manner that indicates an intent to keep the groundfish alive.

5 AAC 28.190. Harvest of bait by commercial permit holders in Eastern Gulf of Alaska Area

The holder of a valid CFEC interim use or limited entry permit may take groundfish in the waters of Alaska in the Eastern Gulf of Alaska Area for use as bait in the commercial fishery for which the permit is held as follows:

(1) groundfish may be taken at any time;

(2) unless use of a gear is restricted in 5 AAC 27 - 5 AAC 39, groundfish may be taken by any gear specified in 5 AAC 39.105 except trawls;

(3) no more than 10 percent, by weight, of all other species of fish on board the vessel may be demersal shelf rockfish, and no more than 10 percent, by weight, of all other species of fish on board may be lingcod;

(4) a person on board a vessel used to take bait under the provisions of this section may not participate in the sablefish fishery if restricted by 5 AAC 28.180;

(5) a person who takes groundfish under this section must report that harvest to the department on departmental fish tickets within seven days after landing a species for which the bait was intended;

(6) groundfish taken under this section may not be:

(A) purchased or sold; or

(B) transported outside of the waters of Alaska in the Eastern Gulf of Alaska Area;

(7) sablefish taken under this section must be cut in half laterally between the first and second dorsal fin immediately after capture, and may not be retained aboard a vessel after the cessation of the fishing trip during which the sablefish was used as bait.

LITERATURE CITED

Allen and Smith 1988. Atlas and zoogeography of common fishes in the Bering Sea and north Pacific. NOAA Tech. Rep. NMFS-NWFSC 66, 151p.

Bergmann, W. 1975. Southeastern region sablefish stock status report. Program Review Report, Alaska Department of Fish and Game, Division of Commercial Fisheries. Juneau, AK.

Bracken, Barry 1983. The history of the U.S sablefish fishery in the Gulf of Alaska, 1902-1982. Alaska Sea Grant Report 83-8. p41-47

Carlile, David W., Beverly Richardson, Margaret Cartwright, Victoria M. O'Connell. 2002. Southeast Alaska stock assessment activities 1988-2001. Alaska Department of Fish and Game. RIR IJ02-02, 86 pp.

Edson, Q.A. 1954. Preliminary report on the Alaska sablefish fishery. Pacific Marine Fisheries Commission Bulletin 3. Portland, OR.

Funk, Fritz and Barry Bracken 1984. Growth of sablefish in Southeastern Alaska. Alaska Sea Grant Report 83-8. p51-57

Hoenig, J. M. 1983. Empirical use of longevity data to estimate mortality rates. Fishery Bulletin 82:898-903.

Johnson, Scott L. and Terrance J. Quinn II 1988. Catch-age analysis with auxillary information of sablefish in the Gulf of Alaska. Contract report to National Marine Fishery Service, Auke Bay, Alaska. 79 pp. Center for Fisheries and Ocean Sciences, University of Alaska, Juneau, Alaska.

Kimura, Daniel K., A. M. Shaw and F. R. Shaw 1998. Stock Structure and movement of tagged sablefish, *Anoplopoma fimbria,* in offshore northeast Pacific waters and the effects of El Nino-Southern Oscillation on migration and growth. Fish. Bull. 96:462-481.

Kolloen, L. N. 1944. Sablefishing: Alaska Decline Calls for Closed Season. Pacific Fisherman. December 1944. Pp 73-77.

Krieger, K. 1997. Sablefish, *Anoplopoma fimbria*, observed from a manned submersible. Pp 39-44. IN Biology and Management of Sablefish, *Anoplopoma fimbria.* Wilkins and Sauders (Editors). NOAA Technical Report NMFS 130. Seattle, WA. 275 pp.

Low, Low L., George K. Tanonaka, Hebert H. Shippen 1976. Sablefish of the northeastern Pacific Ocean and Bering Sea. Northwest Fisheries Center Processed Report. October 1976.

McDevitt, Sandra A. 1990. Growth and analysis of sablefish (*Anoplopoma fimbria),* from mark recapture data from the northeast Pacific. M.S. Thesis, University of Washington, Seattle.

McFarlane, Gordon A. and R. J. Beamish 1983. Summery of results of the Canadian sablefish tagging program. Alaska Sea Grant Report 83-8. p147-183

McFarlane, Gordon A. and W. D. Nagatta 1988. Overview of sablefish mariculture and its potential for industry. *In* proceedings of the Fourth Alaska Aquaculture Conference, p. 105-120. Alaska Sea Grant Rep. 88-4.

Richardson, B. 2001. NSEI sablefish marking pot survey cruise report: Miss Conception, June 21–July 7, 2001. Alaska Department of Fish and Game. RIR IJ01-38. 24 pp.

Richardson, B. *In press a.* 2001 NSEI (Chatham) Sablefish Longline Survey Report, August 8–August 13, 2001. Alaska Department of Fish and Game. Regional Information Report.

Richardson, B. *In press b.* NSEI sablefish marking pot survey report *F/V Miss Conception,* June 15–June 30, 2002. Alaska Department of Fish and Game. Regional Information Report.

Sasaki, T. 1985. Studies on the sablefish resources in the North Pacific Ocean. Bulletin 22 (1-108) Far Seas Fishery Laboratory. Shimizu, 424, Japan.

Seber, G. A. F. 1982. The estimation of animal abundance and related parameters. MacMillan Publishing Co. New York.

Sigler, M. F., J. T. Fujioka and S. A. Lowe. 1997. Sablefish. *In* Stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska. North Pacific Fisheries Management Council. P.O. Box 103136, Anchorage, AK.

Sigler, M. F. 2000. Abundance estimation and capture of sablefish (Anoplopoma fimbria) by longline gear. Can. J. Fish. Aquat. Sci. 57:1270-1283.

Sigler, M. F., T. L. Rutecki, D. l. Courtney, J. F. Karinen and M-S Lang. 2001. Young-of-the-year sablefish abundance, growth, and diet. Alaska Fisheries Bulletin 8(1): 57-70.

Sigler, Michael F., Chris R. Lunsford, Sandra A. Lowe, and Jeffrey T. Fujioka 2001. Alaska sablefish assessment for 2002. In stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska. North Pacific Fisheries Management Council. P.O. Box 103136, Anchorage, AK.

Alaska.

Williams, T. and B.C. Bedford. 1974. The use of otoliths for age determination. In: The ageing of fish. Proceedings of an international symposium. Eds: T. B. Bagenal. Unwin Brothers Limited, Surrey, England. pp. 114-123.

Wing, Bruce L. 1985. Salmon stomach contents from the Alaska troll logbook program 1977-1984. NOAA Technical Memorandum NMFS F/NWC-91

Wolotira, Robert J. et al. 1993. Geographic and bathymetric distributions for many commercially important fishes and shellfishes off the west coast of North America, based on research survey and commercial catch data, 1912-84. NOAA Technical Memorandum NMFS-AFSC; C55.13/2: 6

Yang, M-S and M. W. Nelson 2000. Food habits of the commercially important groundfishes in the Gulf of Alaska in 1990, 1993, and 1996. NOAA Technical Memorandum NMFS-AFSC-112. 174 p.

Table 1. NSEI sablefish fishery fleet size and catch reported on fish tickets, 1969–2001.

Year	Number of Permits in Directed Fishery[a]	Total Poundage Reported Removed From NSEI[b]	Number of Vessels
1969		400,521	
1970		421,344	
1971		315,692	
1972		1,089,150	
1973		977,995	
1974		815,731	
1975	110	984,179	
1976	125	970,313	
1977	95	559,031	
1978	80	788,523	
1979	110	1,190,356	
1980	65	881,469	
1981	53	710,147	
1982	46	804,004	
1983	68	1,165,871	
1984	86	1,329,072	
1985	105	3,084,914	
1986	138	4,179,554	
1987	158	3,950,758	
1988	149	4,258,691	148
1989	151	3,788,690	150
1990	121	3,345,485	122
1991	127	3,988,220	126
1992	115	4,324,343	116
1993	120	5,833,463	121
1994	121	4,743,147	118
1995	121	4,595,532	116
1996	121	4,733,102	115
1997	122	4,804,458	111
1998	116	4,767,943	105
1999	112	3,102,600	98
2000	111	3,171,242	94
2001	111	2,260,053	87

[a] Prior to 1985 there was not a NSEI sablefish permit card so the number of permits includes sablefish landings made on mixed gear codes, B (halibut) permits, C (sablefish) permits, M (misc fin) and a few S (salmon).

[b] Fish ticket data prior to 1985 was entered onto the database without a dress (condition) code and it appears that landings were converted to round pounds before being entered

Table 2. NSEI sablefish fishery harvest objectives, management actions, survey design changes, a dock-side data, and seasons, 1867–2001.

YEAR	Guideline Harvest Range	Harvest Objective (round weight)	Per Share Quota (round weight)	Season	Dates Fishery Open	Management Actions	NSEI Survey Design Changes	Dock-Side Data
1867	no quota				year round	Federal management of Alaskan fisheries began with the purchase of the Alaskan Territory.		
1871	"				"	US Commission of Fish and Fisheries established.		
1903	"				"	US Bureau of Fisheries established.		
1906	"				"	An Act for the Preservation and Regulation of the Fisheries of Alaska enacted.		First landing records available
1932-1944	"				"			Vessel logs maintained
1945-1946	"			03/16-11/30	03/16-11/30			"
1947-1958	"			05/01-11/30	05/01-11/30		Alaska Department of Fishery first tagged in March, October, and November 1951; tagged 989. Again in 1952; tagged 2,909.	"
1959	"			"	"	Alaska Statehood. Fisheries management transferred to the state. BOF maintained regulations already in place in 1959.		"
1960	"			"	"			Vessel logbook program discontinued. No monitoring of fishery performance 1960-1978.
1961-1962	"							
1963-1969	"			08/15-10/15	08/15-10/15			
1970-1971	"			09/15-11/15	09/15-11/15	1970 pot gear first allowed.		
1972	"			09/01-11/15	09/01-11/15	Incidental catch allowance was reduced to 20% in 1972.		
1973	1,000,000 dr			"	EO	Quota requested by industry. Fishery closed by Emergency Order.		
1974-1975	"			"	09/01-11/15			
1976	"			"	"	Magnuson Fisheries Conservation and Management Act (MFCMA).		
1977	"			"	"			

-continued-

Table 2. (page 2 of 5)

YEAR	Guideline Harvest Range	Harvest Objective (round weight)	Per Share Quota (round weight)	Season	Dates Fishery Open	Management Actions	NSEI Survey Design Changes	Dock-Side Data
1978	"			"	"	Voluntary agreement by Japanese North Pacific Longline-Gillnet Association to voluntarily withdraw from the area east of Yakutat Bay. Sablefish became prohibited species in US fisheries for other species.		1978 NMFS and ALFA introduce cooperative voluntary logbook program.
1979	850,000 dr			"	EO	Southeast Groundfish Project established. Quota reduced by department recommendation to account for portion of previous quota that came from outside waters. Season closed by Emergency Order. Closure to foreign fishing enforced by Federal Regulation.	Released 37 tagged sablefish on ADFG crab survey. 07/20/79-07/19/79	
1980	500,000-900,000 dr			"	09/01-11/15	GHR by department recommendation based on annual harvest from previous 10 years and allowing two standard deviations from mean to determine range. Registration 72 hours prior to fishing instituted for all vessels in NSEI by phone, in person, by radio. Difficult to enforce. Repealed in 1985.	No ADFG sablefish survey.	Voluntary skipper interviews for trips
1981	"			"	09/01-10/10	Fishery closed by Emergency Order.	Non-standardized survey. Sablefish pot survey w/ *R/V Stellar* included tagging, stomach content study and subsample from lengths and weights. 05/20/81-05/29/81.	"
1982	300,00-900,000 dr			"	09/01-09/15	Lower end of GHR reduced. Pot gear no longer allowed in NSEI. Fishery restricted to longline only. Fishery closed by EO.	No ADFG sablefish survey.	"
1983	"			"	09/01-09/07 & 10/10-10/14	Fishery openings set by EO.	"	"
1984	"			"	01/01-03/03 & 09/01-09/05	Groundfish management within the intrusion areas beyond the three-mile territorial limit was formally conveyed to the state through an amendment to the MFCMA.(01/01-03/03 open period represents landings in this intrusion area during federal opening). Fishery openings set by EO.	"	"

-continued-

Table 2. (page 3 of 5)

YEAR	Guideline Harvest Range	Harvest Objective (round weight)	Per Share Quota (round weight)	Season	Dates Fishery Open	Management Actions	NSEI Survey Design Changes	Dock-Side Data
1985	500-1,500,000 dr			"	09/04-09/05 & 10/04-10/06	Limited Entry program adopted for this fishery. First year Chatham specific CFEC permits were issued (ie C61A). Vessel operators who could demonstrate landing during a regular season prior to December 31, 1984 were eligible to apply for permits. Registration requirement was repealed. GHR increased. Groundfish went from 5 digit salmon statistical areas to current 6 digit groundfish statistical areas. Mgt area boundaries remained the same. Regulation initiated to require unloading sablefish prior to fishing sablefish in NSEI and unloading after NSEI prior to fishing another area. Fishery openings set by EO.	Non-standardized survey. Commercial vessel released 538 tags. 12/20/85, 1 day.	"
1986	"			"	09/09-09/11	No gear in water 72 hour prior and 24 hr after rule in regulation. Fishery set by EO.	Non-standardized survey. Commercial vessel w/ conventional gear released 3,126 tags. 1/20/86-02/04/86.	"
1987	"			"	09/15-09/16	Begin 24 hour opening by EO.	No ADFG survey.	"
1988	"			"	09/19-09/20		Begin annual longline surveys using a commercial vessel, snap gear, approx 2 weeks, 1000 hooks per station, 1 hour soak, herring for bait, 3-meters spacing, vessel's gear, 24 stations in 3 major statistical areas, tagged sablefish every third station. Subsample 10% for AWL. 08/14/88-08/26/88.	"
1989	"			"	09/22-09/23	NSEI management area 1st described in Regulations, previously described as the northern sablefish area. Bait regulations instituted, includes sablefish as bait, up to 2,000 pounds allowed annually, more with a permit.	2nd year annual survey. Decreased hooks to 500 per station. No tagging. Increased stations to 44 in same survey area. 08/07/89-08/25/89. Cooperative survey including tagging with NMFS on Townsend Cromwell.	"
1990	"			"	09/12-09/13		3rd year annual survey. Vessel's gear include swivel hooks and beads. Set 40 stations. 08/26/90-09/10/90.	"

-continued-

Table 2. (page 4 of 5)

YEAR	Guideline Harvest Range	Harvest Objective (round weight)	Per Share Quota (round weight)	Season	Dates Fishery Open	Management Actions	NSEI Survey Design Changes	Dock-Side Data
1991	"			"	09/16-09/17	Changed stat area line between Frederick Sound and Chatham Strait.	4th year annual survey. Began using weight of 2.26 kg every 100 hooks. Used ADFG vessel *R/V Stellar* and ADFG standardized snap gear. 08/13/91-08/30/91.	"
1992	"			"	09/17-09/18		5th year annual survey. Used commercial vessel and both commercial gear and ADFG gear. 08/17/92-08/31/92.	"
1993	"			"	09/25-09/26		6th year annual survey. First year using ADFG vessel *R/V Medeia* with ADFG gear. Decreased survey to 38 stations. 08/23/93-09/08/93.	"
1994	1,000,000-3,000,000 dr	4,761,905	38,889	"	09/22-10/22	First year of 3 year trial quota-share system. Regulations specify a single 30 day during 09/01-11/15 season. GHR increased and capped at 3,000,000 dr pounds. Annual harvest limit to be set within the GHR based on survey information and is to be divided equally among all eligible permit holders. Written registration required prior to 1 week before season opens. Allow retention of tagged sablefish. Sablefish taken for use as bait must be "mutilated". Sablefish taken as bait must be reported on ADFG fish tickets.	7th year of annual survey. No change from 1993. 08/23/94-09/05/94.	"
1995	"	"	"	"	09/13-10/13	In person written registration required prior to fishing. Applied .63 conversion to dressed wt for vessels landing in round.	8th year of annual survey. Only set 30 stations with ADFG snap gear, one hour soak, and herring. Set 30 sets right next to these sets using 3-hour soak (6 of these sets using conventional gear), and squid. 08/23/95-09/08/95.	"
1996	"	"	"	"	09/08-11/08	Season extended to 60 days.	9th year of annual survey. Same design as 1993-1994. 08/17/96-08/31/96. In addition, the *F/V Ida June* made 16 conventional sets independent of the survey during the same time period to assess using commercial vessels and conventional gear and squid for future surveys.	"

-continued-

Table 2. (page 5 of 5)

YEAR	Guideline Harvest Range	Harvest Objective (round weight)	Per Share Quota (round weight)	Season	Dates Fishery Open	Management Actions	NSEI Survey Design Changes	Dock-Side Data
1997	1,590,000-4,800,000 rnd	4,800,000	39,300	"	09/01-11/15	BOF decision to make permanent the quota share system after first 3 years of trial system. Initiated sablefish management based on round weight (.63 conversion to be used from Eastern cut to round weights). Instituted confidential logbooks requirement for each trip (to be attached to fish tickets at time of landing). Season set in regulation as entire period September 1 - November 15.	10th year of annual survey however with major changes. Used 3 commercial vessels fishing concurrently, approx 1 week duration, vessel's conventional gear, *illex* squid as bait, approx 1100 hooks per set, 3-11 hour soak time, approx 2 meter spacing. Increased area of survey by adding 7 stations on the south in 345603. Began tagging, tagging a portion of the stations. Sampled approx 5% for AWL. 08/07/97-08/13/97.	Mandatory logbooks required
1998	"	"	41,700	"	"		11th year of annual survey. No changes from 1997. 08/13/98-08/19/98.	"
1999	"	3,120,000	28,000	"	"	Harvest Objective decreased 35%.	12th year of annual survey. Used only 2 instead of 3 vessels this year to complete survey. Tagged. Did not use tentacles on squid. 08/15/99-08/23/99.	"
2000	"	"	28,600	"	"	EYAK was deleted from 72-24 hr rule. Full retention of all rockfish (not including thornyheads) in inside waters in effect July 5th. CFEC review of optimum number of permits (re) confirmed 73 as optimum number.	13th year of annual survey. Returned to 3 vessels. Began using ADFG standardized gear. Did not tag . 08/16/00-08/23/00. First year of marking (tagging) with commercial pot vessel in 3 statistical areas.	Fishery lengths Mandatory logbooks required
2001	"	2,184,000	19,600	"	"	Sablefish harvest objective was decreased 30% from year 2000 to 2,184,000 for 2001 with notification of indications showing further cut necessary to 1,700,000 for 2002. Public meetings were held in Petersburg, Sitka and Juneau.	14th year of annual survey. No changes from 2000 except for timing. 08/08/01-08/13/01. Second year of marking (both tags and only clips) with commercial pot vessel in 4 statistical areas.	"

dr=dressed weight
rnd= round weight

Table 3. Distribution of NSEI sablefish fishery harvest in percentage of round pounds by statistical area and year, 1999–2001.

Statistical Area	1999	2000	2001
335701	2.2	2.9	1.7
335731	0.0	0.0	0.0
345534	0.1	0.0	0.0
345603	18.3	20.6	11.7
345631	25.5	28.4	29.8
345701	30.1	28.1	31.1
345702	3.4	4.5	5.6
345705	0.0	0.0	0.0
345731	10.4	8.3	12.3
345803	9.7	7.0	7.5
355801	0.2	0.1	0.2
355830	0.1	0.0	0.0
365804	0.0	0.0	0.0

Table 4. NSEI sablefish fishery landed bycatch of other species compared to sablefish landings from landings with logbooks, 2000–2001.

Species	2000 round pounds	2000 percent bycatch relative to sablefish landings	2001 round pound	2001 percent bycatch relative to sablefish landings
Sablefish (target)	3,061,734		2,124,700	
Yelloweye rockfish	877	0.03	293	0.01
Shortspine thornyheads	257,664	8.42	151,572	7.13
Rougheye rockfish	45,312	1.48	27,944	1.32
Shortraker rockfish	136,417	4.46	35,077	1.65
Redbanded rockfish	6,614	0.22	4,211	0.2
Pacific cod	5,664	0.18	920	0.18
Arrowtooth flounder	18	0.00	3,749	0.04
Total landed bycatch	454,566	14.79	225,767	10.53

Table 5. NSEI sablefish fishery summary of methods for calculation of directed quota and EQS, 2002.

Statistic	Explanation	Calculation	Amount (pounds are round)	Remaining TAC (round pound)
Peterson Estimate	Applied to mark-recapture data		23,000,000	
Exploitable Biomass Estimate	The lower 90% confidence limit of the Peterson estimate was chosen to account for uncertainty		21,500,000	
Harvest Rate	$F_{40\%}$ (0.101) provides equilibrium level of spawning recruit equal to 40% of the equilibrium level of spawning per recruit in absence of any fishing.	(21,500,000) * 0.101	2,171,500	
Total Allowable Catch 2002	Applies to all sablefish removals from NSEI.			**2,171,500**
Mortality associated with halibut fishery	Approximately 10% of 2C halibut quota is taken in NSEI in waters deeper than 100 fm. This results in 850,000 pounds halibut for 2002.	(850,000)*0.26 *0 .50	110,000	2,061,500
	The bycatch rate (pounds halibut to pounds sablefish) of sablefish on IPHC halibut survey sets deeper than 100 fm in NSEI for 2000 and 2001 is 26% (0.26).			
	The mortality to sablefish bycatch from the NSEI halibut fishery is estimated at 50%.			
Other non-directed mortality such as legal bait sets, personal use removals and bycatch mortality associated with other fisheries	Data is not available for these removals. The estimated 50% (0.50) mortality associated with the halibut fishery is intended to also include these removals for 2002.			
Discard mortality associated with directed fishery	The mortality to sablefish in directed fishery from sand fleas, sharks, and hooking mortalities is estimated to be 3% (0.03) of remaining quota.	(2,061,500 * 0.03)	62,000	2,005,000
2002 Directed Fishery Quota				**2,005,000**
Number of permits	Number of CFEC permits allowed to fish 2002		**109**	
Equal Quota Share		(2,005,000 / 109)	**18,400**	

Table 6. International Pacific Halibut Commission (IPHC) survey data used to estimate sablefish bycatch mortality in the halibut longline fishery in NSEI for 2002 quota calculation.

Station	Year	Legal Halibut Pounds	Sablefish Number	Avg Pound Sablefish[a]	Rate	Hooks	Depth fm	IPHC Area
3073	2000	2193	25	6.6	0.08	700	120	161
3091	2000	418	130	6.6	2.05	700	185	162
3094	2000	2071	25	6.6	0.08	700	175	162
3095	2000	2233	40	6.6	0.12	700	146	162
3096	2000	515	40	6.6	0.51	700	168	161
3073	2001	1329	0	6.6	0.00	490	139	161
3077	2001	687	0	6.6	0.00	500	152	161
3091	2001	461	114	6.6	1.63	500	188	162
3094	2001	1441	64	6.6	0.29	500	156	162
3095	2001	1206	60	6.6	0.33	500	156	162
3096	2001	432	20	6.6	0.31	500	187	161
3101	2001	1061	35	6.6	0.22	500	167	171
Total:		14047	553	6.6	0.26			

[a] Based on the 2001 NSEI Longline Survey average weight of sampled fish.

Figure 1. An adult sablefish. Photo by Pat Malecha, NMFS.

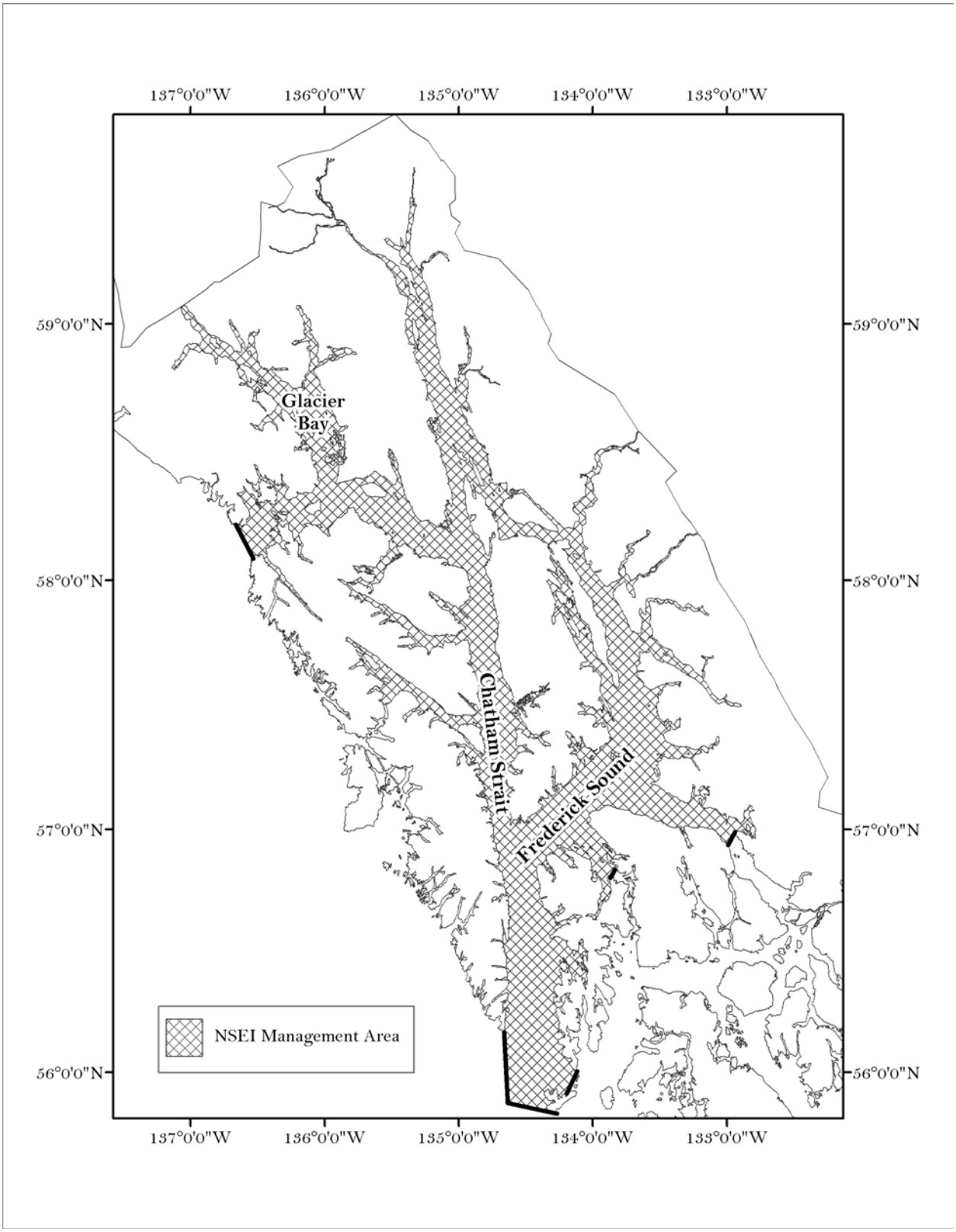


Figure 2. Northern Southeast Inside (NSEI) management area.

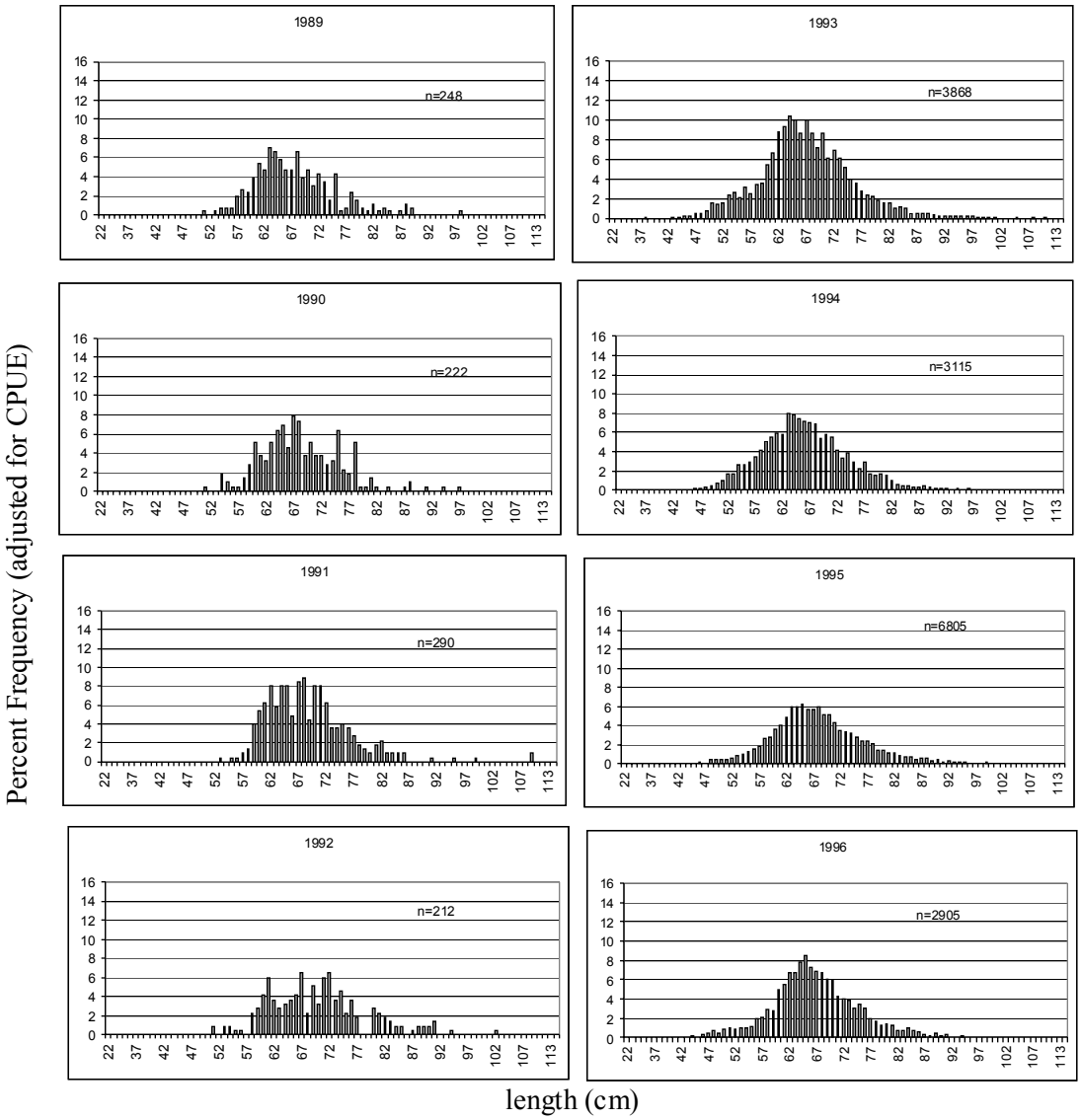


Figure 3. NSEI sablefish length (centimeters) frequency distributions from annual longline research survey samples (x axis) scaled by survey catch per unit effort in round pound-per-hook (y axis), 1989–2001.

-continued-

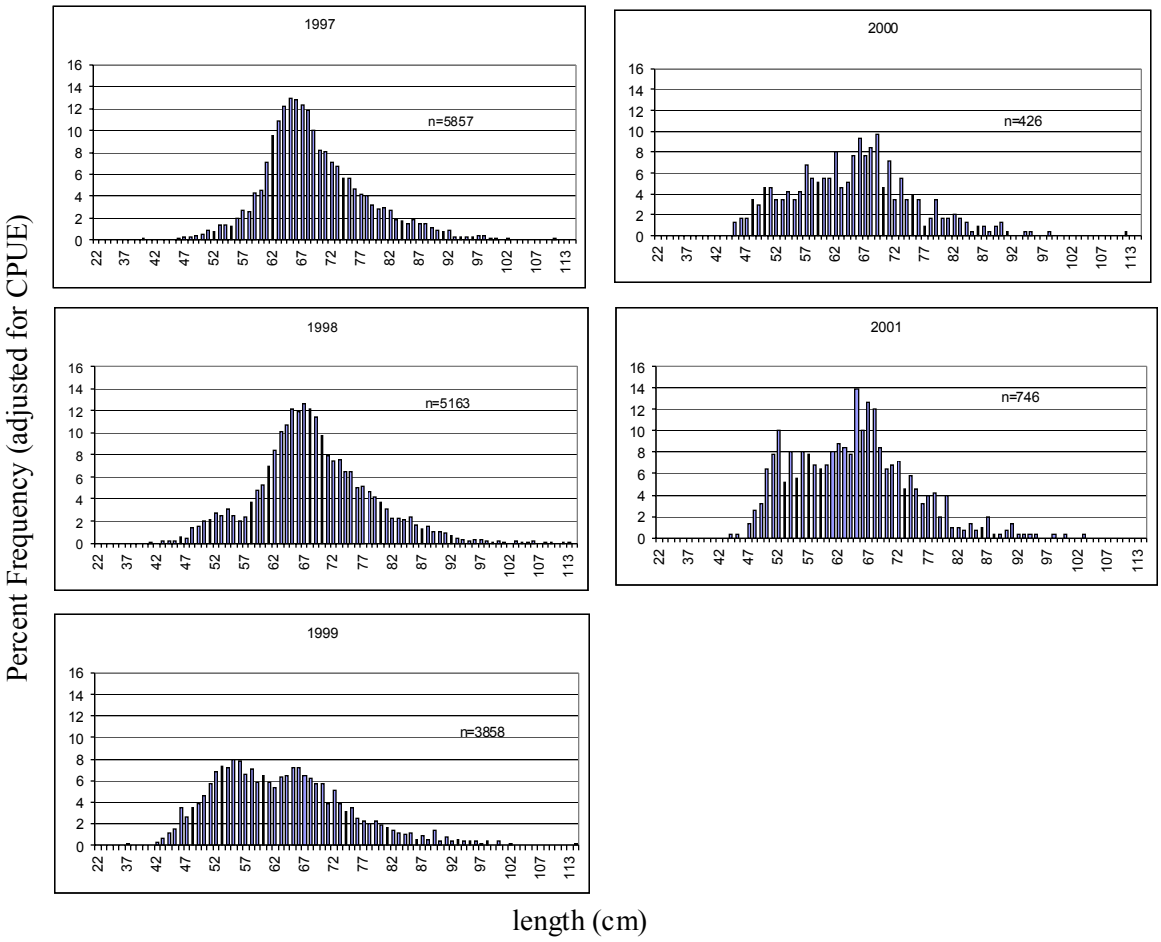


Figure 3 cont. NSEI sablefish length (centimeters) frequency distributions from annual longline research survey samples (x axis), scaled by survey catch per unit effort (y axis) in round pounds-per-hook, 1997–2001.

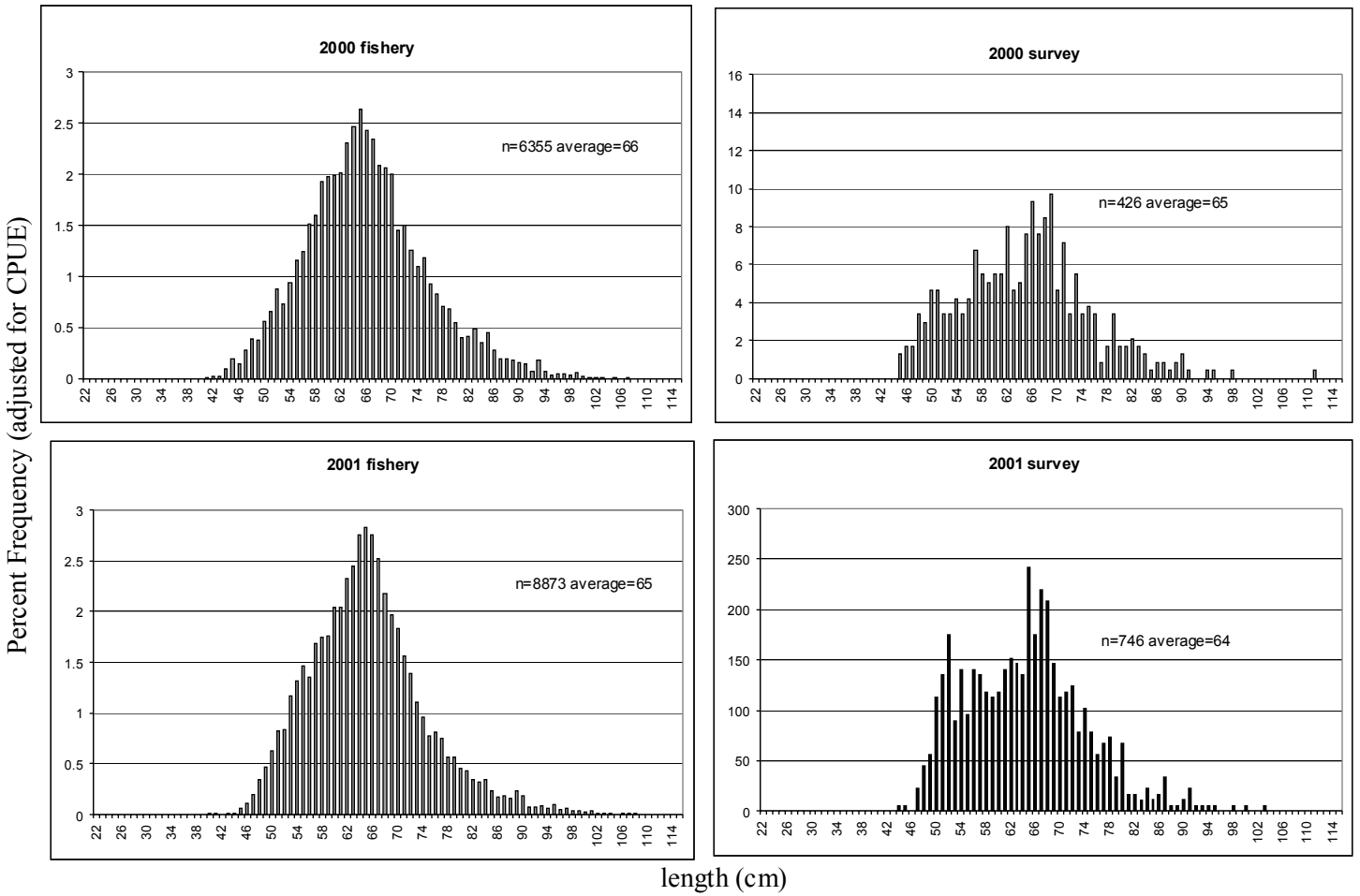


Figure 4. NSEI sablefish length (centimeters) frequency distributions for sablefish port samples compared to annual longline research surveys, 2000–2001. Frequencies are relative, scaled by catch per unit effort in round pounds-per-hook.

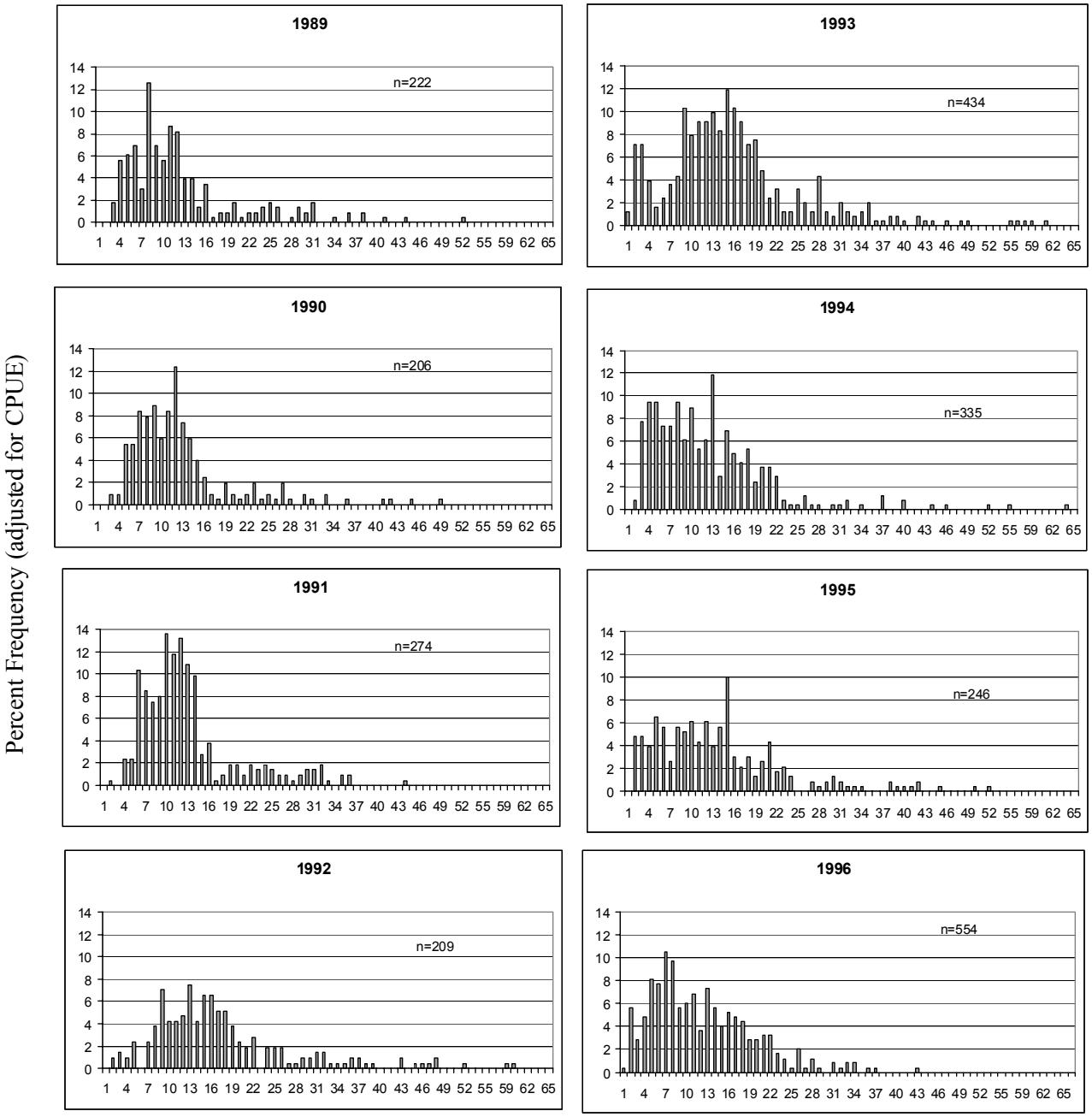


Figure 5. NSEI sablefish age (year) distribution (x axis) by year, collected from annual longline research surveys, scaled by survey catch per unit effort in round pounds-per-hook (y axis), 1989–2001.

-continued-

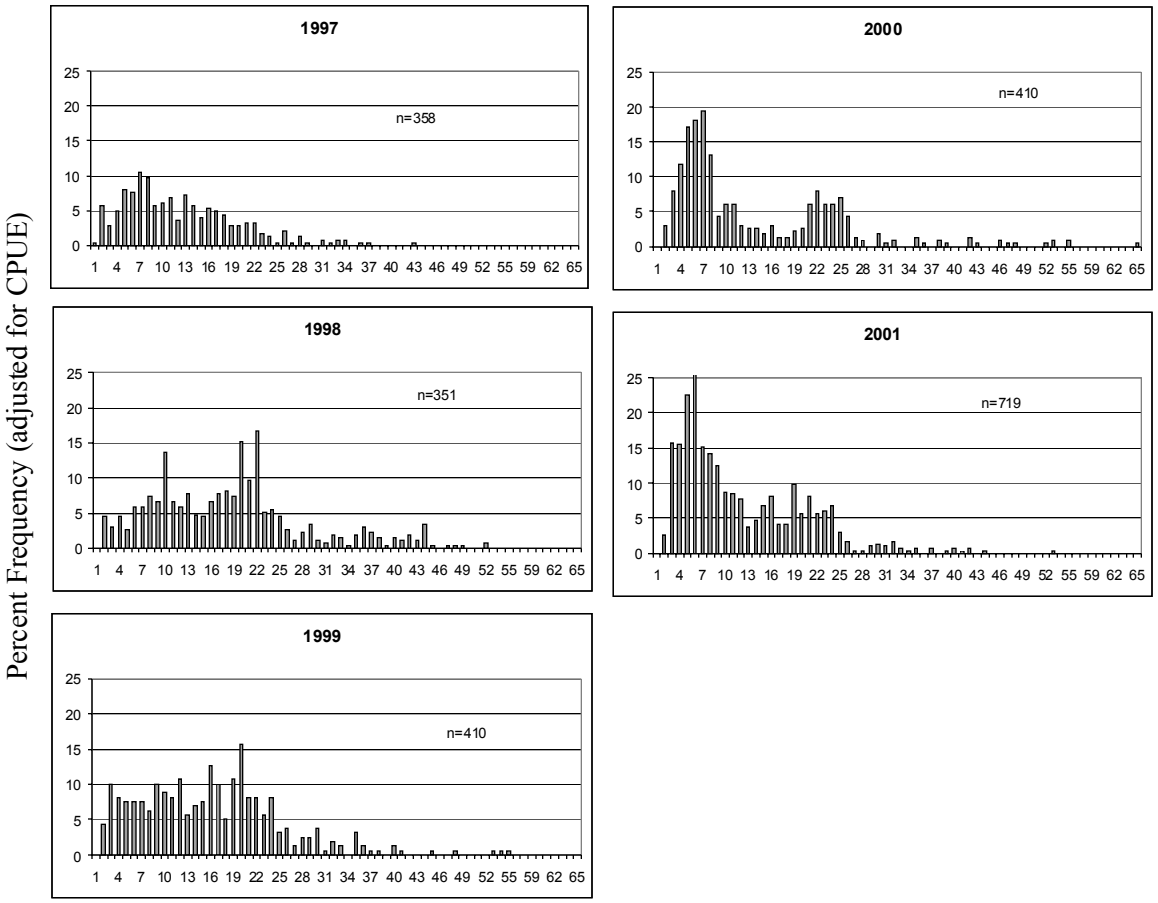


Figure 5 cont. NSEI sablefish age (year) distribution (x axis) by year, collected from annual longline research surveys, scaled by survey catch per unit effort in round pounds-per-hook (y axis), 1989–2001.

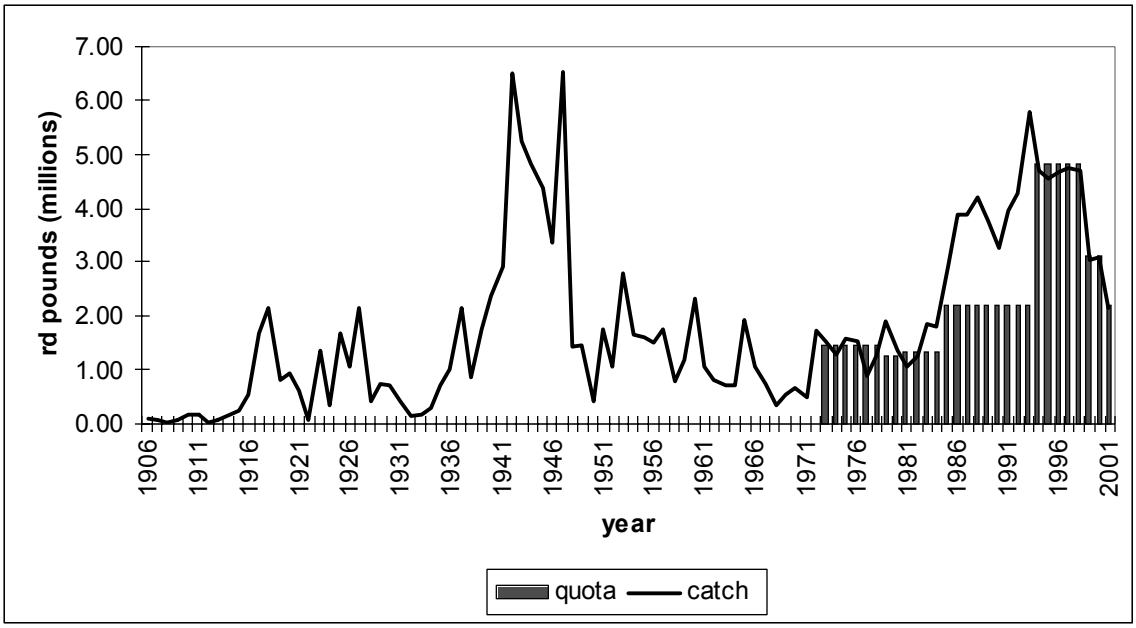
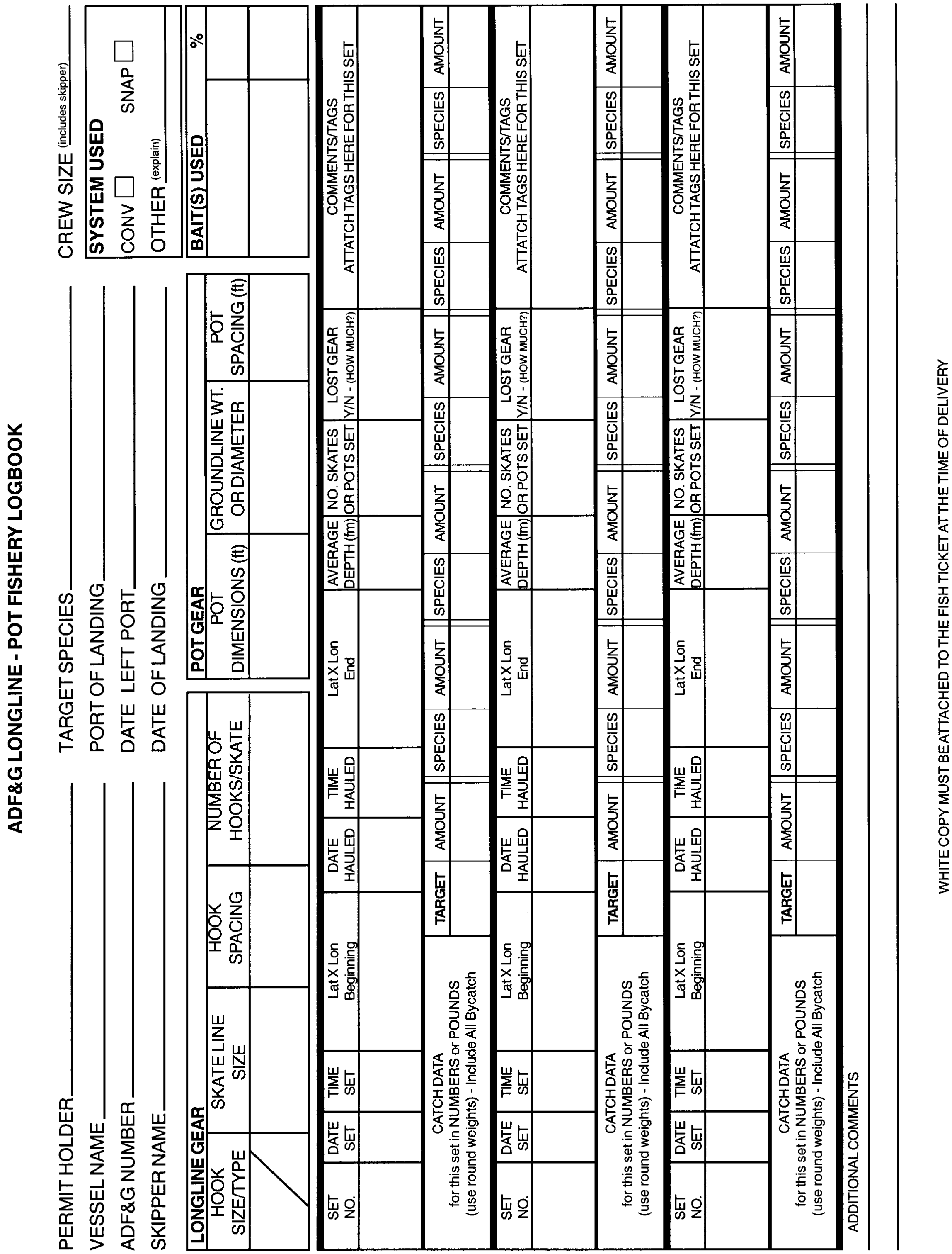


Figure 6. NSEI sablefish fishery recorded harvest and quotas in round (rd) pounds, 1906–2001.


ADF&G LONGLINE - POT FISHERY LOGBOOK

PERMIT HOLDER ______ TARGET SPECIES ______ CREW SIZE (includes skipper) ______

VESSEL NAME ______ PORT OF LANDING ______

ADF&G NUMBER ______ DATE LEFT PORT ______

SKIPPER NAME ______ DATE OF LANDING ______

SYSTEM USED: CONV ☐ SNAP ☐ OTHER (explain) ______

LONGLINE GEAR			
HOOK SIZE/TYPE	SKATE LINE SIZE	HOOK SPACING	NUMBER OF HOOKS/SKATE

POT GEAR		
POT DIMENSIONS (ft)	GROUNDLINE WT. OR DIAMETER	POT SPACING (ft)

BAIT(S) USED	%

SET NO.	DATE SET	TIME SET	Lat X Lon Beginning	DATE HAULED	TIME HAULED	Lat X Lon End	AVERAGE DEPTH (fm)	NO. SKATES OR POTS SET	LOST GEAR Y/N - (HOW MUCH?)	COMMENTS/TAGS ATTACH TAGS HERE FOR THIS SET

CATCH DATA for this set in NUMBERS or POUNDS (use round weights) - Include All Bycatch	TARGET	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT

SET NO.	DATE SET	TIME SET	Lat X Lon Beginning	DATE HAULED	TIME HAULED	Lat X Lon End	AVERAGE DEPTH (fm)	NO. SKATES OR POTS SET	LOST GEAR Y/N - (HOW MUCH?)	COMMENTS/TAGS ATTACH TAGS HERE FOR THIS SET

CATCH DATA for this set in NUMBERS or POUNDS (use round weights) - Include All Bycatch	TARGET	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT

SET NO.	DATE SET	TIME SET	Lat X Lon Beginning	DATE HAULED	TIME HAULED	Lat X Lon End	AVERAGE DEPTH (fm)	NO. SKATES OR POTS SET	LOST GEAR Y/N - (HOW MUCH?)	COMMENTS/TAGS ATTACH TAGS HERE FOR THIS SET

CATCH DATA for this set in NUMBERS or POUNDS (use round weights) - Include All Bycatch	TARGET	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT	SPECIES	AMOUNT

ADDITIONAL COMMENTS

WHITE COPY MUST BE ATTACHED TO THE FISH TICKET AT THE TIME OF DELIVERY

Figure 7. Commercial logbook page.

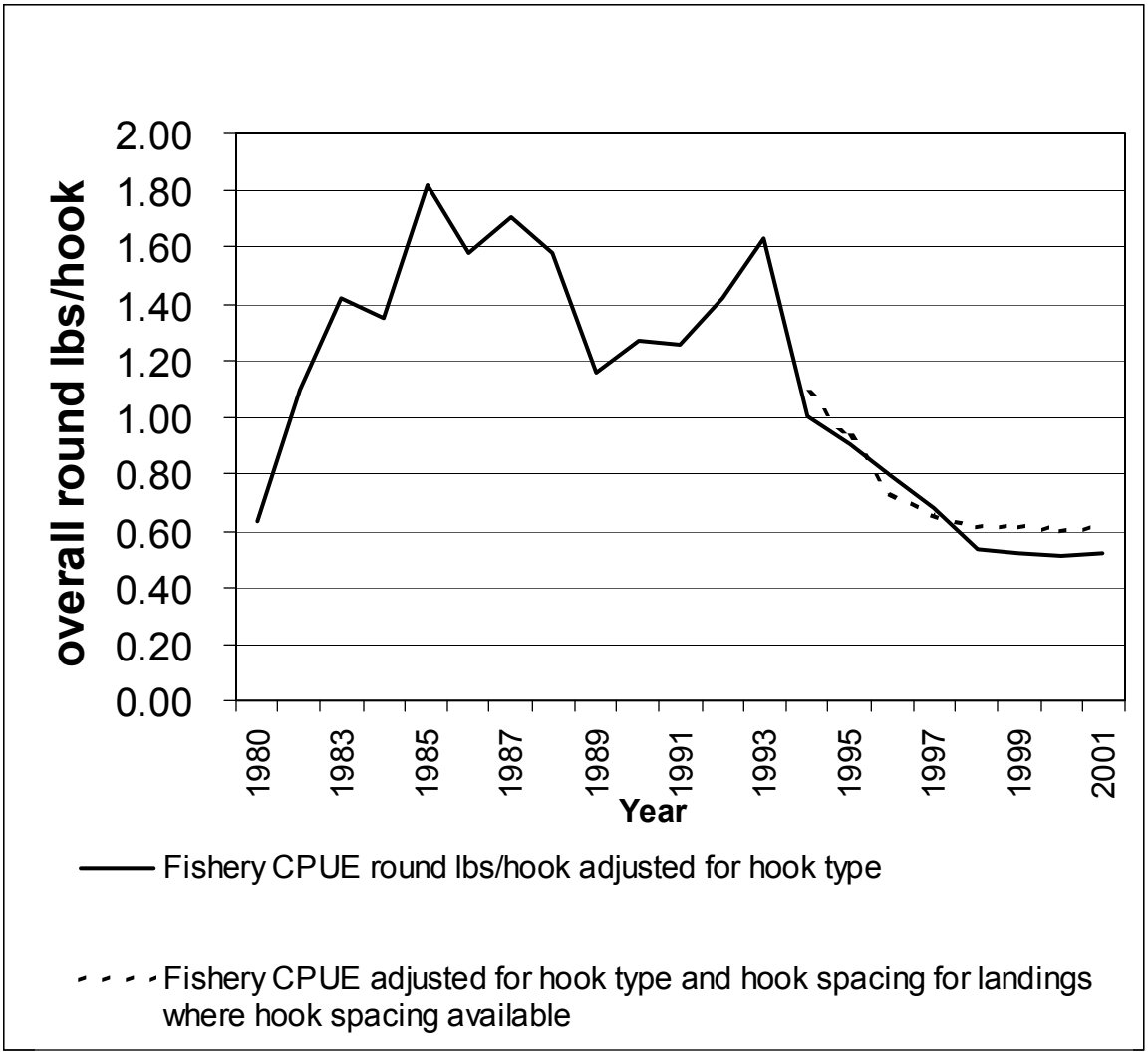


Figure 8. NSEI sablefish fishery CPUE (fleet overall) with gear adjustments, in round pounds per hook, 1980–2001.

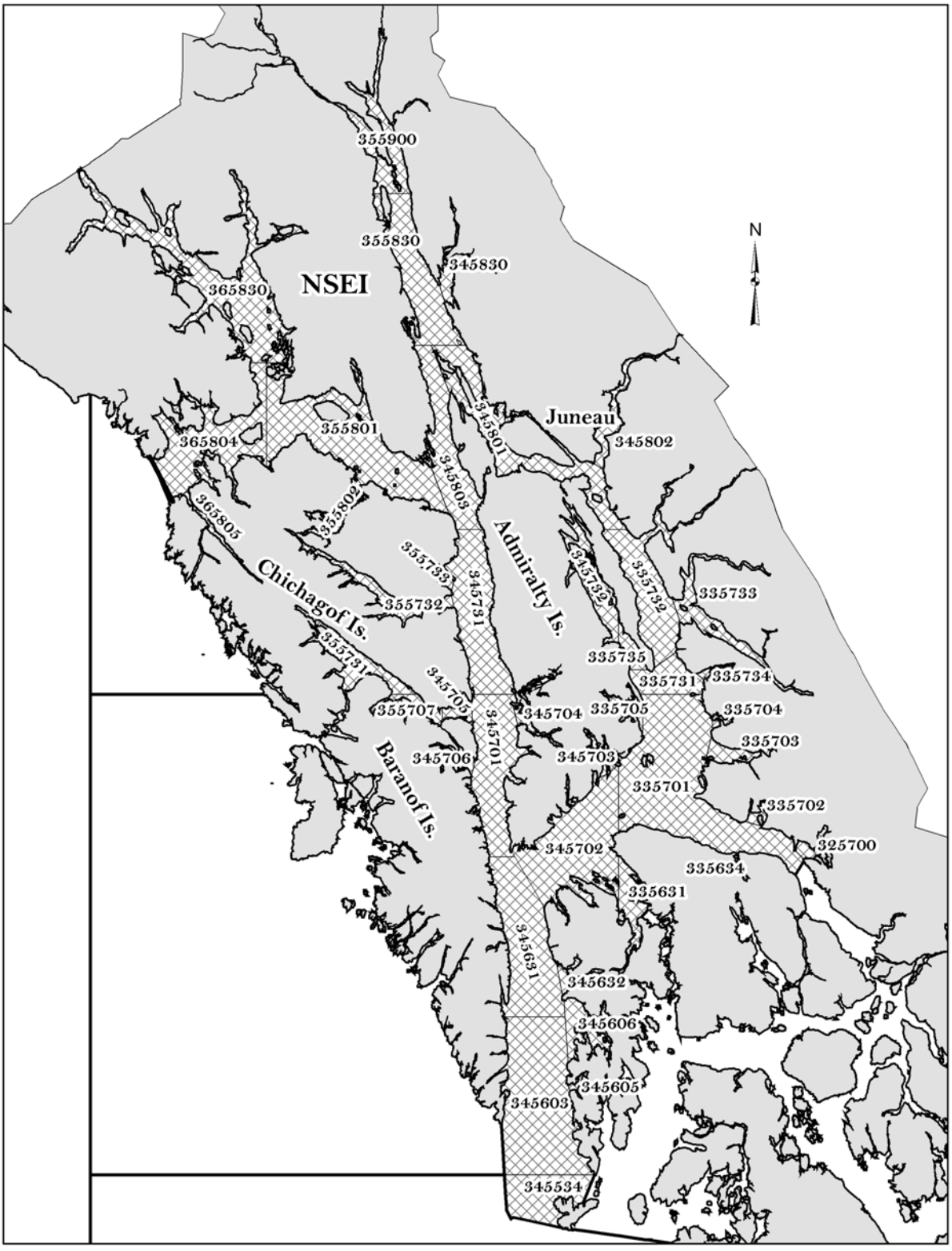


Figure 9. Statistical area chart of NSEI.

APPENDIX 1

A REVIEW OF THE CHATHAM STRAIT SABLEFISH STOCK ASSESSMENT PROGRAM

REVIEW PANEL

Bruce Leaman (Chair)
Jeff Fujioka
Gordon Kruse
Mark Saunders
Mike Sigler

Juneau, Alaska
February 26-28, 2002

TABLE OF CONTENTS

Introduction

The Alaska Department of Fish and Game (ADF&G) manages the sablefish fishery in Chatham Strait, located in the inside waters of Southeast Alaska. In response to changes in relative abundance indices, concerns expressed by industry, and contemplated changes in the assessment of this management unit, the department determined that a review of its assessment and management program would be timely. A panel of external reviewers was constituted and met with departmental staff in Juneau, during February 26 – 28, 2001. The panel members were Jeff Fujioka (National Marine Fisheries Service (NMFS), Juneau), Gordon Kruse (University of Alaska, Fairbanks – Juneau Center), Bruce Leaman (International Pacific Halibut Commission (IPHC), Seattle), Mark Saunders (Department of Fisheries and Oceans (DFO), Nanaimo, BC, Canada), and Mike Sigler (NMFS, Juneau).

This report details the panel's review and evaluation of the department's program. It was drafted and assembled in Juneau and its content reflects the short time available to conduct and finalize the review during this period. We wish to express our thanks to the ADF&G regional staff who provided comprehensive materials, particularly Dave Carlile for his candor, knowledge, and responsiveness, Victoria O'Connell for her lead role in the review process, and Beverly Richardson and Deidra Holum for their additional assistance. The review material provided to us (Carlile et al. 2002, and other supplemental information) was detailed and all requests concerning additional information were treated with courtesy and dispatch. We could not have completed the review without the positive attitudes and contributions of ADF&G staff.

The panel conducted a detailed one-day session with staff and reviewed both material provided in advance as well as additional material requested at the session. We then met in closed session over two days to evaluate the program and draft this report. We have attempted to evaluate as many aspects of the program as time permitted and recognize that the report is neither comprehensive nor exhaustive. The report is divided into the following sections: Stock Structure and Species Biology; Data Issues; Abundance Estimation; and, Stock Management and Harvest Policy. The panel's high priority recommendations have been italicized for emphasis.

Stock Structure and Species Biology

Stock Structure

Sablefish range from southern California to the western Aleutian Islands. Southern and northern stocks are believed to separate in central British Columbia (BC). Management units are divided by agency jurisdictions. Chatham sablefish are part of the northern stock whose adults reside in the Alaska EEZ and northern BC. The general pattern of sablefish movement is reasonably well understood but has not been incorporated in stock assessment models. Incorporation of detailed age and size-specific movement patterns into models is limited by data availability and represents a major challenge that has not been completed. Discussion centered on the methods and advantages of assessing the Chatham management unit independently or as part of the broader northern stock.

Assess as a Unit Stock

The current age-structured analysis (ASA) model treats Chatham as a closed population in which individuals enter the population only as juveniles and leave only from natural and fishing mortality. Tagging information indicates that adult fish enter and leave Chatham Strait and therefore one would not expect the model to be able to provide an accurate estimate of absolute biomass without including explicit transfer functions to address immigration and emigration, which appear to be size dependent. The ASA

model could be used to manage Chatham as a unit stock if it were constrained or scaled to an appropriate biomass level, combined with an index of abundance and an appropriate harvest strategy. Quota recommendations for Chatham should also consider the quota recommendations and stock trends in other management units, e.g., the U.S. exclusive economic zone (EEZ) and northern BC.

Assess as Part of the Northern Stock

A simple assessment approach which recognizes that Chatham fish are part of the northern stock would be to combine the catches, age composition, and biological data with the indices of relative abundances (e.g., CPUE x habitat area) for Chatham and other parts of the northern stock into a single integrated model. The appropriate harvests for the components of the combined stocks would be obtained by apportioning the overall harvest using the relative abundances of the components.

A more complicated approach would involve modeling each component of the northern stock and incorporate movement rates among the components. Such a model would more realistically represent the dynamics between the management units of the overall stock and would be useful to evaluate the consequences of different management strategies and tactics. Such a model may not be necessary for management if exploitation rates and abundance trends are similar among management units, however such an evaluation has not been conducted.

Further Evaluation of Stock Structure

No conclusion was reached on the best assessment approach, however the panel felt that further research is needed to provide more information on the movement of fish into and out of Chatham Strait. Size-specific movement rates should be estimated to evaluate whether Chatham can be assessed as a separate unit. Parameter values would need to be estimated, if a complex compartmental model is warranted. The panel noted that all tagging, both in Chatham and in adjacent waters, is done only during the summer and wondered whether tagging during other times of the year would reveal a seasonality of movement. Tagging during the spawning season, for example, may provide insight into the spawning location of Chatham sablefish. Published analyses of tagging data have not distinguished seasonal, ontogenetic, and random movements, but estimation of these components may be necessary for a realistic population dynamic model.

Spawning Stock/Recruit

It is not known whether successful spawning occurs in Chatham Strait, or whether it is entirely dependent on recruitment from the Gulf of Alaska (GOA). Winter surveys of adult biology and egg/larval distributions coupled with a spring larval survey and a summer young-of-the-year survey could address this question. Additionally, otolith elemental fingerprinting could be considered to determine where Chatham fish were spawned, or where they reared as juveniles. This would have to be a multi-agency study covering spawning aggregations in the GOA and possibly off BC.

Natural Mortality Estimates

M is assumed to be 0.1 in the analyses presented based on estimates produced by Funk and Bracken (1984). In a recent assessment, Haist et al. (2001) considered values of M from 0.08 to 0.1 to encompass the range reported in assessments throughout the northeast Pacific. Sigler et al. (2001) estimated M to be ~0.1 in an age-structured analysis of Alaska EEZ data. The panel suggests that:

- Hoenig's (1983) method of estimating M should be applied to age compositions from Chatham Strait.

- Analyses such as ASA and spawner biomass per recruit (SBR) should include an examination of the sensitivity of the results to the range of M's noted above.

Size and Age at Maturity, Length and Weight at Age

These parameters have changed significantly for many stocks in the northeast Pacific in concert with changing environmental conditions, potentially impacting abundance estimates from age structured and mark-recapture analyses. Changes in size and age at maturity and size at age should be examined for the Chatham stock.

Recruitment Indices

It is desirable within an assessment framework to forecast trends in recruitment. Although it is regarded as a lower priority, the panel recommends that consideration should be given to utilizing existing surveys that show promise as pre-recruit indices for the GOA. In particular the surface gillnet surveys conducted annually since 1995 (Sigler et al. 2001) and/or the salmon surface trawl surveys could be examined.

Sablefish Ageing

Sablefish are difficult to age and age compositions show signs of ageing problems, with considerable smearing, making it difficult to follow strong year classes through time. These problems are encountered for every stock aged. We recommend the following:

- Continued participation in the Committee of Age Reading Experts (CARE) reporting to the Technical Sub-committee of the Canada/US Groundfish Committee (TSC) with frequent exchanges of sablefish age structures to resolve ageing issues and ensure that ages for the northeast Pacific stocks are as comparable as possible.
- Implement routine monitoring of among reader precision and evaluation of ageing criteria against known age samples. Error should be incorporated into any age-structured analyses, e.g., Heifetz et al. (2001).
- Attempt to validate true age with alternate methods.

Data Issues

Survey Data

The panel did not attempt an in-depth review of the design of the longline survey for Chatham Strait. Nonetheless, we offer some specific advice concerning certain aspects of the assessment surveys for consideration.

Survey Design

Consider stratification of the annual assessment survey to reduce variance in CPUE using variables such as depth. Studies in BC found significant differences in age composition with depth. Likewise, Bechtol (2001) found an increase in mean length of sablefish with depth from 200 to 800 fathoms. The panel recognizes that the particular bathymetry of Chatham Strait may not lend this area to such an approach, but at least some spatial distribution of fish by size is suggested by some of the longline data.

For instance, sablefish were mostly 50–60 cm in set 1 and 65–80 cm in set 2 from the longline catches in association with the pot survey conducted in June–July 2001. Depth considerations may affect not only the strata into which particular stations might be placed, but such considerations may also influence the direction of set deployment within a station. Sets that traverse different depths, rather than following isobaths, will be inherently variable, if fish size and age are a function of depth. Depth stratification of survey stations may be a means to reduce within station variance and should be explored for Chatham Strait.

The panel suggests that the department consider experiments to evaluate sources of within-site variance in survey catches. This would be useful to better understand the relative contributions of within- and among-site variance components, and would be helpful to consider the merits of the current and alternate survey designs. Experience with other species suggests that diel and fortnightly (tides) variability in survey catches within a station can exceed variability among stations.

Sample Sizes

Target sample sizes should be determined for particular desired levels of precision of the biological parameters being estimated. Appropriate procedures include those employed by Carlile (1997) to estimate sample size necessary to estimate age composition within specific ranges of the true age proportions with specific probabilities. This sample size estimate should be revisited, if estimates of age compositions of males and females are to be estimated separately. Target sample sizes should be estimated for other biological attributes, including length frequency, and sex ratio, as well. Our expectation is that sample sizes needed to estimate sex ratio and length frequency with similar levels of precision to age proportions would be lower and higher, respectively.

It appears that actual sample sizes during the surveys may have been driven by the capacity of the ADF&G age reading laboratory to process samples, rather than by the desire to achieve desired levels of precision of the estimates. Desired target sample sizes should be met regardless of the capacity of the age reading laboratory to process the samples in a particular year. It is the panel's understanding that sample size targets for age composition are not being routinely met. Moreover, target sample sizes for length composition have not been established to our knowledge, and the resulting length frequency compositions from surveys appear to lack desirable levels of precision. Ideally, funding should be located to process the needed number of age samples but, regardless, otoliths can be archived until some later time when age reading capacity is increased. The panel feels that it is far preferable to over-sample than to under-sample.

Data Standardization

Major changes in the assessment survey were implemented fully in 1997. These included a switch from herring to squid as bait, hook spacing decreasing from 3 to 2 m, and soak time from 1 to 3 or more hours. Bait was also changed to chopped mantles from chopped whole squid in the late 1990s. These changes could have had marked effects on survey catchability. In 1995 and 1996 some concurrent surveys were conducted using pre- and post-change survey features, and both data sets should be more fully explored in an attempt to separate potential confounding effects. An analysis of the 1995 data to contrast 1- versus 3-hr soak times (Figure 5) was not completely satisfactory, because a change in bait was confounded with the change in soak time. ***A more detailed analysis should consider whether some variability in the 1- vs. 3-hr soak time relationship is attributed to the fact that some data with extra long soaks (up to 11 hr) are included in the 3 hr data***. Accounting for these long soaks may strengthen the relationship between 1- and 3-hr soak times. Also, a 1-hr soak survey and 3-hr soak survey were conducted in 1996. The

authors did not analyze these results because the stations were not paired. However, the stations covered the same general survey area. ***We recommend analysis of the 1996 data to help compare the catchability of the two surveys.***

A more complete analysis of the concurrent survey data should consider other potential responses in addition to mean CPUE. For instance, changes in the survey could have a significant effect on size of fish caught. Effects on fish size and CPUE (in terms of weight) should be examined. Implications on biomass estimation could be significant. ***Once a conversion for pre-1997 and post-1996 survey CPUE is established, the older survey results should be adjusted or expressed in the units of the new CPUE time series, not the other way around***.

Fishery Data

Accurate estimates of catch are essential to any credible fishery stock assessment and management program. The panel has the following recommendations to improve the estimation of catch.

Landings Samples

We believe the highest priority recommendation for improving the data collection program is the addition of a sampling program of fishery landings. In the present age-structured model, the survey is the only source of information on the population age structure. Given evidence of highgrading, it is important to determine the age structure of landings in order to understand the effects of removals. Minimally, landing samples should include length frequency, age, and sex. As with the survey, procedures such as employed by Carlile (1997) should be applied to estimate appropriate sample sizes, given potential differences in size, age, and sex by area and time (within the season).

Lacking historical fishery sampling data, potential information about size composition could be gleaned from historical data on market size categories. The panel understands that there have been marked changes in the size structure of the Chatham Strait stock over time (i.e., loss of older/larger individuals). If true, this could indicate highgrading and could be a sign of high exploitation rates on large fish combined with highgrading. Documentation could verify a worrisome loss of older individuals that should trigger an even more precautionary approach to fishery management.

Estimated Total Fishing Mortality

Total fishing mortality (total removals) should be estimated for use in the assessment and management of this stock. The current assessment and management program does not clearly distinguish among catch and landings and appears to rely mainly on landings data. To obtain estimates of total fishing mortality, several steps must be taken.

First, discard rate of small (and dead) sablefish must be estimated for the directed fishery. From previous experience of some panel members, it is difficult to estimate discard rate from observed commercial fishing vessels, because discard rate may be sensitive to whether or not the vessel is being observed. So, a first approximation of discard rate can be obtained from the difference between size composition from longline survey catches and size composition from the fishery. Regarding discard mortality rates, values may be available from the literature. However, it must be recognized that the

discard mortality rate depends upon release methods (e.g., careful removal of hooks from released fish vs. use of crucifiers or gaffs to remove small fish from the longline).

Second, mortality rates for discarded fish should be estimated. Such estimates have been derived from tagging studies in conjunction with condition factor assessment for other species, in other fisheries (Hoag 1975, 1976; Williams et al. 1989). These estimates should be examined for their applicability to sablefish until estimates that are more appropriate can be generated.

Third, bycatch and bycatch mortality of sablefish in other fisheries should be enumerated. This includes the bycatch of sablefish in the halibut longline fishery (the IPHC survey data may be useful as an analogue of the halibut fishery but the systematic design of that survey must be considered when comparing results with normal halibut fishing), catch of sablefish for bait, and any sources of sablefish mortality in other fisheries. Even if some of these are difficult to estimate, estimates of these mortalities should be generated and included in the total removals from this stock.

Finally, some sablefish die before they are brought aboard and are not marketable owing to rigor mortis or predation by amphipods. Some estimate of such "deadloss" could be generated by survey data.

Quotas for the directed fishery should be adjusted to recognize these and all sources of fishing mortality. The prescribed quota should be set to account for this total mortality.

Logbook Data

We recommend some changes to the logbook form to include grading size (size below which the vessel discards), discard amount per set, and bait amount (e.g., pounds of bait per 100 hooks), not just bait type. Also, we recommend that the logbook form should clarify whether catch (sablefish that come to the rail) or landings (retained catch) is to be recorded. We assume that the latter is the case, but the lack of clarity could cause confusion and, perhaps, differences in data collection.

Fishery Data Analysis

It may be worthwhile to consider conducting a historical analysis of gear characteristics. An attempt should be made to standardize fishing effort so that fishery CPUE records are most meaningful. The analysis should consider variables such as changes in hooks (C-hooks vs. J-hooks) bait type and amount, hook spacing, and other potentially important variables.

It is curious that the survey CPUE (with 3-plus hr soak) outperforms fishery CPUE. There must be a logical reason for this, and the reasons should be investigated. Part of the reason is that the survey monitors catch per unit effort whereas current fishery sampling monitors landings per unit effort (i.e., not counting discards). However, there must be other reasons for the discrepancy, and these should be investigated. For example, one possible reason is the intensity of the share-quota fishery. Although the fishery lasts two months, apparently 80% of the 70 boats start fishing on opening day. Catch rates may decline rapidly in this derby-like fishery, thus lowering average CPUE during the fishing season compared to CPUE for the survey that is conducted on essentially unfished grounds.

The panel noted analyses of inseason fishery CPUE (really, LPUE) data expressed by week of the fishing season. It is most likely that CPUE declines sharply during the first few days of the season, so it would be valuable to plot CPUE by day rather than by week.

Ancillary Data

In addition to survey and fishery data, some adjunct data may be very useful to the stock assessment program. We recommend collecting the following information:

- IPHC survey data on bycatch of sablefish in Chatham Strait should be considered. These data could be used to generate alternate estimates of total fishing mortality, and they may be useful as an auxiliary index of sablefish abundance.

- CPUEs from the sablefish pot survey should be considered as ancillary data for population estimation. Toward this end, gear, bait (e.g., type and quantity), and other attributes of this survey should be standardized.

Tagging Data

Well-designed mark-recapture studies can be a valuable addition to a stock assessment program, and further developments in this area may be useful. In particular, we offer the following advice.

Experiments to date have included capture of fish for tagging by longlines in August and by pots in July. Effects of both capture method and tagging dates confound interpretation of recovery rates. The effect of capture method is suggested by the higher recovery rate from pot-caught fish over longline-caught fish, whereas the effect of time of liberty is suggested by increased tag recovery rates after the first year of liberty for longline-caught fish. ***We recommend the conduct of parallel experiments to distinguish these confounding effects. Specifically, capture method and tagging dates should be tested for their potential individual effects on tag recovery rate***.

Although the pot capture of sablefish for tagging in July produced the most satisfying recapture results, we recommend these parallel experiments before settling on gear type and tagging time. Each capture method may offer some advantages and disadvantages. Also, it should be recognized that, if longline capture methods do affect recovery rate owing to hook shyness or other factors such as higher tagging mortality, it is quite possible that pot capture methods also result in some similar, albeit smaller, effects. Even if all other assumptions of the Petersen estimation method were met, this factor alone would lead to overestimation of population size.

In conducting population size estimation, the tagged population and exploited stock should be reconciled. For instance, if some of the tagged fish are smaller than those caught and retained by the fleet, then stock size may be overestimated. On the other hand, small fish of tagged sizes may be caught by the gear but discarded at disproportionate rates. Data reviewed by the panel indicates that this may, in fact, be the case. Methods should address whether it is preferable to apply a discard size function to the tagging data or whether is preferable to adjust the recoveries for discards.

Currently, tag shedding, tag reporting, and tagging mortality rates are estimated together. ***We recommend the department consider incorporating the tag-shedding rate estimated by Lenarz and Shaw (1997) into the tagging analysis.***

The panel recommends that the population of fish that are tagged should be sampled for their attributes, such as age, sex, and size. These data may be very informative to the analysis of tag return rates, which could be influenced by these factors.

ADF&G staff indicated a desire to explore the potential of passively induced transponder (PIT) tags for sablefish. The panel encourages this research. PIT tags hold good promise for estimating population size. Fishers cannot see the tags thus eliminating the need to estimate a tag reporting rate, which is one of the largest sources of uncertainty in tagging studies using external tags. The prospect for sampling a large proportion of the landings at major processing plants is appealing. Pilot studies should be conducted to address usual questions, such as detection rates, tag location, and so on. It should be noted that because tagged fish will not be detected until landing, the PIT tags will not provide information on fine scale movements. Additionally, movement information will require investment by other agencies in the detection technology. In fisheries such that in BC the implementation of PIT tagging may be problematic because the majority of fish are processed at sea.

For tagging studies designed to address migration, the panel strongly recommends interagency cooperation to augment the value of such studies. Estimation of migration rates among areas would be an asset to population modeling in Chatham Strait and in other areas occupied by the northern stock of sablefish.

Abundance Estimation

ADF&G staff have completed a substantial amount of quantitative analyses and data collection. ***We recommend that the authors provide quota recommendations based on these quantitative analyses, with appropriate caveats***. This section will address the analyses completed to date, why some analyses appear reasonable, and suggestions for future development of these analyses.

Age-structured analysis

ADF&G staff completed an age-structured analysis (ASA) of Chatham Strait sablefish data. The retrospective analysis, Monte Carlo simulations, and pattern of residuals imply that the approach is reasonable to determine stock trends and estimate abundance, with appropriate caveats.

Retrospective analysis: The ASA was completed with time series lengths of 1980–1996, 1980–1997, … and 1980–1999. Abundance estimates were similar for the three most recent time series (Carlile et al. 2002, Figure 10), although the panel noted some divergence in the earliest estimates, whereas these estimates should show convergence among the time series. However, the similarity among the time series' estimates indicates that consistent abundance estimates can be inferred with the available data.

Monte Carlo simulations: Simulated data were used to test the model's ability to infer abundance. Abundance estimates inferred from simulated data were similar to the simulated true values (Carlile et al. 2002, Figure 8). This similarity indicates that abundance can be estimated with the available data if the data are unbiased and from a closed population. A simulation exercise incorporating a range of movement rates to and from Chatham Strait would help assess model sensitivity to the closed population assumption.

Residuals: The model captured the trend of decreasing catch rates from the mid-1980s to the present (Carlile et al. 2002, Figure 6). One discrepancy was the lack-of-fit to the observed catch rate spike in 1993. Typically, population models cannot replicate sharp changes in observed relative abundance. For example, Bering Sea pollock and cod abundance data both have inter-annual changes that age-structured modeling cannot replicate (Ianelli et al. 2001, Thompson and Dorn 2001). Age pooling, the lack of single,

distinct year classes appearing consistently through the time series of age data, and inconsistencies between trends implied by age and abundance data likely contribute to this effect for Chatham sablefish. The observed and predicted age proportions often were similar, although a few large discrepancies exist (e.g., age 8 in 1989) (Carlile et al. 2002, Figure 7). Some lack-of-fit likely is added by emigration of younger fish from Chatham Strait and immigration of older fish to Chatham Strait.

Fishery selectivity is assumed equal to survey selectivity in the ASA. This assumption likely is incorrect because fishers appear to discard small fish. One check for this assumption is to compare the survey and fishery length data. The long-term solution is to collect fishery age data, as recommended in the Data Issues section of this report, then include this data in the ASA.

Currently the 1-hour soak and 3-plus hour soak surveys are adjusted to a single standard to create a single survey index from 1988-present. An alternate approach is to maintain separate survey indices and estimate separate catchability coefficients for each survey in the ASA. In this approach, the mean and variance of soak-time comparisons can be used to create a prior probability distribution which links the catchability estimates from the two surveys. Other aspects of the 1-hour and 3-plus hour soak time conversions are discussed in the Data Issues section of the panel report.

The ASA examined Chatham Strait sablefish data. Substantial amounts of data exist for the remainder of the northern sablefish stock, of which sablefish in Chatham Strait are a part. As mentioned previously, limiting the data examined to Chatham alone also contributes to lack-of-fit due to sablefish migration. Two options for assessing the abundance of sablefish in Chatham Strait are to integrate data from other regions occupied by the stock or to include migration parameters to track this interchange.

A stand-alone model based on Chatham Strait data may provide reasonable results in part because the abundance index is similar to indices for other parts of the stock. The EEZ index, the northern BC pot survey and fishery indices, and the Chatham Strait index all show a substantial (about 50%) decline in the abundance index since the late 1980s and early 1990s. The implied abundance for an area depends on this abundance index and the magnitude of the catch from the area, with abundance inferred from the effect of that catch on the abundance index (e.g., if a 1,000 mt catch results in a 10% decline in the index, then estimated abundance is 10,000 mt). However, Chatham abundance may be overestimated due to the effect of migration. Older sablefish typically move to the eastern Gulf of Alaska, including Chatham Strait. Thus immigration may compensate for some catch levels that otherwise would have caused a decrease in the abundance index. The potential bias of not accounting for this migration is to overestimate sablefish abundance in Chatham Strait.

Mark-Recapture Analyses

Mark-recapture experiments in 1997 and 1998 failed: more tags were recaptured in the year following tagging than in the initial tagging year. We concur with the authors' conclusion that abundance estimates from these experiments should not be used for assessment and management.

Mark-recapture experiments in 2000 and 2001 appear much more successful, though not problem-free. For 2000, the size composition and statistical area weighted approach to the estimate of exploitation rate appears the most appropriate, given the experimental design. For 2001, the approach that used differential sablefish densities appears reasonable, given the experimental method used.

The authors concluded that capture probability by the marking and recapture gears were different in 2000 (Carlile et al. 2002, Figure 18) from 2001 (Carlile et al. 2002, Figure 23). Though differing significantly in 2000, neither difference appears biologically important. The authors chose different mark-recapture

analyses based on this nominal difference: in 2000, an exploitation rate estimate based on tag returns and a reporting rate estimate; in 2001, an abundance estimate based on tail clips.

Harvesters appear to selectively retain tagged, small fish and discard small fish with no mark. The length distribution of releases is similar to the distribution for recaptures (Carlile et al. 2002, Figure 18), but dissimilar to the distribution for the fishery overall (Carlile et al. 2002, Figure 17). Fewer small fish are landed in the fishery overall.

The analyses are complicated by some experimental methods, which in hindsight, should be changed. For example, the 2000 exploitation rate estimate is weighted by size composition and statistical area. One complication occurs because the marking gear differs from the recapture gear. Size selection may differ between the two gears with some evidence of an additional seasonal effect. We recommend evaluating the use of the same mark and recapture gears to eliminate size selectivity effects due to gear. Another complication has already been recognized by the lack of releases in area 345603, where 20% of catch occurred. In 2001, fish were marked in this area to correct this shortfall.

The current approach of capturing sablefish for marking with pots and the 1-1/2 month period of liberty between marking and recapture has been reasonably successful, even with the complications we have mentioned. This approach should be continued until another method has been proven. Any evaluation of longline gear for both marking and recapture should be tested experimentally and proven successful before abandoning pot gear for marking. The 1-1/2 month period between mark and recapture likely is important for the success of the 2000 and 2001 experiments and should be retained.

The authors estimate tag-reporting rate from relative return rates of tags and tail clips. An alternate approach is to compare the number of tags recovered per unit weight of catch during the survey and fishery. This approach has been used successfully to estimate tag-reporting rate for the Alaska EEZ (Heifetz and Maloney 2001).

Stock Management and Harvest Policy

Successful long-term management of the Chatham sablefish management unit requires the development and application of a formal harvest policy. In its simplest form, the policy relies on the application of a target exploitation or fishing mortality rate to the estimated abundance of the management unit, to produce a recommended catch limit. In addition to a scientifically sound stock assessment, a more complete policy also requires target, limit, and threshold reference points, and protocols for changing recommended catch limits in response to assessment results.

Uncertainty is likely to exist in the estimate of absolute biomass, so an appropriate harvest strategy should be conservative and robust to errors in biomass estimation. The adjustable fishing rate control rule, which is the maximum level used by the North Pacific Fishery Management Council (NPFMC) for acceptable biological catches and overfishing levels, has been shown to be more robust to biased estimates than a constant exploitation rate. A decision analysis such as that used for NPFMC sablefish should also be considered, particularly for species at low level of abundance.

The panel believes that most of the elements for a broader policy are developed only partially for this fishery. The Precautionary Approach to management suggests that in the absence of such elements and/or in data poor situations, a limit reference point (e.g., overfishing biomass level, lowest observed biomass level, etc.) should be a formal component of the management strategy. ***Without a detailed population dynamics model and an understanding of management unit dynamics at low levels of abundance, the panel recommends that the department develop such a limit reference point.*** As the stock approaches

such a limit reference point, remedial fishery management actions should be taken to alter the trajectory of the management unit biomass and avoid attainment of the limit point (e.g., quota reduction). The panel believes that the department should commit to the development of a formal harvest policy, which would include at least the above elements, as a long-term goal.

The panel believes that the management of the Chatham sablefish management unit requires a formal process of stock assessment, similar to that used for stocks managed by the NPFMC, PSMFC, and DFO. This should include analysis of both historical and contemporary data on the management unit, development of recommended yield options and their justification to address stock management goals, and a scientific review of the assessment. Inherent in this process is an articulation of stock management goals. The character of these goals falls under the department's mandate and was not part of the panel's assignment. We do not perceive that the department has undertaken this formal process and believe that it is a necessary precursor to any scientific evaluation of the management program.

Long-Term Management

The assessment material provided does not include a detailed population dynamics model that might allow longer-term projection of biomass and a more proximal stock management approach is therefore required. Such an approach will need to reference immediate management unit behavior in response to management actions, while a more comprehensive assessment is being developed. The latter will be constrained by time required to accumulate necessary data. Time series of age, abundance, and biological data that are of duration sufficient to estimate key parameters are required to fuel such a population dynamics model. Present data sources are at the low end of requirements for this purpose. Recent catches and the resulting abundance trends can be used to evaluate specific harvest recommendations. In addition, the ageing data in particular may have limitations due to the inherent difficulty in age estimation for this species. Longer time series of data are required to estimate stock-recruitment relationships and/or environmental effects on growth and recruitment.

Longer-term management unit management recommendations may also consider a broader context of assessment, including stock definitions that incorporate the biomass in the outside EEZ waters as well as that in the northern regions of British Columbia in the analysis. Tag recovery data indicates sablefish movement among these areas of magnitude sufficient to warrant such consideration. Alternatively, a stand-alone assessment of the Chatham management unit that includes transfer functions with these other management unit units might be considered.

Short-Term Management

The department requested the panel's evaluation of its present understanding of the management unit abundance as well as the suitability of recent and contemplated changes in the recommended catch limits. While recognizing that the material reviewed by the panel is not a formal stock assessment, we believe that sufficient understanding of recent management unit abundance changes exists to develop appropriate short-term recommendations. The changes in relative abundance indices presented in the review material or made available to the panel are consistent with changes observed for the offshore management unit and for the Canadian management unit to the south. In all areas, relative abundance has declined from peak values of the mid-1980s and is now in the range of one-half to one-third of peak values. This conclusion does not speak to the absolute level of biomass but does indicate that broader or similar changes have occurred for management units in adjacent areas. Historical assessments for these areas have indicated a reasonably high degree of coherence in abundance trends for management unit biomass. The consistency of the apparent management unit abundance trends in Chatham Strait with those observed in adjacent management units supports a conclusion of declining biomass of the Chatham management unit. An additional comparison to be considered is the yield per habitat area in Chatham Strait compared with that

from adjacent or other management areas (e.g., Bechtol 2001). Such a comparison can provide a useful reference across areas and management units, when consistent habitat classifications are used and the relative abundance indices are comparable. Since the US EEZ and Chatham sablefish management units are regarded as a parts of a common stock and the survey methodologies used on each are similar, comparison of quotas, productivity, or relative abundance per habitat area could be informative.

We believe that a properly validated ASA will permit short-term projections of biomass that could be used with a harvest policy to arrive at a catch limit recommendation. Candidate estimates sufficient for estimation of a recommended catch limit in 2002 are available in the assessment material provided to the panel. The ASA and tag-recapture analysis both produce biomass estimates that are consistent with management unit declines associated with recent catches and relative abundance trends. In addition to the underlying data limitations, the panel believes estimates from both of these sources may include some bias toward overestimation of exploitable biomass due to uncertainties about the estimated rate of natural mortality and other necessary parameter assumptions, plus the known issue of sablefish movements in this region.

We suggest that the department exercise caution when applying these estimates to calculation of recommended yield. Specifically, we suggest that the limits of our ability to assess the absolute biomass level with current analyses and data make it prudent to use more conservative estimates of biomass than suggested by either the ASA or the tag-recapture estimate. This caution is also warranted by the limited ability to assess the effects of the management measure, under current conditions of declining management unit biomass. Persistent declines in abundance indices and other indicators of stock condition may warrant even greater levels of caution in future years.

References

Bechtol, W. R. 2001. Relative abundance of sablefish and other groundfish caught on longline gear in Prince William Sound, Alaska, 1998. Alaska Dept. Fish and Game, Comm. Fish. Div., Reg. Inform. Rep. 2A01-15, Anchorage.

Carlile, D. 1997. More on sample sizes for groundfish port/survey sampling. Memorandum to Meg Cartwright and Tory O'Connell. Alaska Dept. Fish and Game, Comm. Fish. Div., May 1997, Douglas.

Carlile, D. W., B. Richardson, M. Cartwright, and V. M O'Connell. 2002. Southeast Alaska sablefish stock assessment activities 1988-2001. Alaska Dept. Fish and game, Comm. Fish. Div., Reg. Inform. Rep. 1J02-02, Juneau.

Funk, F. and B. E. Bracken. 1984. Status of the Gulf of Alaska sablefish (*Anoplopoma fimbria*) resource in 1983. Alaska Dept. Fish Game, Info Leafl. 235, Juneau. 55p.

Haist, V., R. Hilborn, and M. Wyeth. 2001. Sablefish stock assessment for 2001 and advice to managers for 2002. Canadian Science Advisory Secretariat Research Document 2001/135.

Heifetz, J. and N. E. Maloney. 2001. Estimation of tag-reporting rates for sablefish in the northeastern Pacific Ocean. Alaska Fish. Res. Bull. 8: 1-11.

Hoag, S. H. 1975. Survival of halibut released after capture by trawls. Int. Pac. Halibut Comm. Sci. Rep. 57.

Hoag, S. H. 1976. The effect of trawling on the setline fishery for halibut. Int. Pac. Halibut Comm. Sci. Rep. 61.

Hoenig, J. M. 1983. Empirical use of longevity data to estimate mortality rates. Fishery Bulletin 82:898-903.

Ianelli, J. N., T. Buckley, T. Honkalehto, G. Walters, N. Williamson. 2001. Eastern Bering Sea walleye pollock stock assessment. In Stock assessment and fishery evaluation report for the groundfish resources of the Bering Sea and Aleutian Islands as projected for 2002. Available North Pacific Fishery Management Council, 605 W 4th Avenue, Suite 306, Anchorage, Alaska 99510.

Lenarz, W. H. and Shaw, F. R. 1997. Estimates of tag loss from double-tagged sablefish, Anoplopoma fimbria Fish. Bull. 95: 293-299.

Sigler, M. F., T. L. Rutecki, D. L. Courtney, J. F. Karinen and M. S. Yang. 2001. Young-of-the-year sablefish abundance, growth and diet. Alaska Fish. Res. Bull. 8: 57-70.

Thompson, G. G. and M. W. Dorn. 2001. Assessment of the Pacific cod stock in the eastern Bering Sea and Aleutian Islands area. In Stock assessment and fishery evaluation report for the groundfish resources of the Bering Sea and Aleutian Islands as projected for 2002. Available North Pacific Fishery Management Council, 605 W 4th Avenue, Suite 306, Anchorage, Alaska 99510.

Williams, G. H., C. C. Schmitt, S. H. Hoag, and J. D. Berger. 1989. Incidental catch and mortality of Pacific halibut, 1962-1986. Int. Pac. Halibut Comm. Tech. Rep. 23.

The Alaska Department of Fish and Game administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information please write to ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; U.S. Fish and Wildlife Service, 4040 N. Fairfield Drive, Suite 300, Arlington, VA 22203; or O.E.O., U.S. Department of the Interior, Washington DC 20240.

For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-4120, (TDD) 907-465-3646, or (FAX) 907-465-2440.